RadiologyInfo.org
For patients

Radiation Safety

X-ray safety



Radiologists (http://www.radiologyinfo.org) and x-ray technologists (http://www.radiologyinfo.org) are trained to use the smallest amount of radiation necessary to obtain x-ray (http://www.radiologyinfo.org) images. Your doctor uses these images to diagnose and treat your health condition. An imaging exam is done only when a doctor feels it is necessary for a diagnosis. Most routine imaging exams have a small amount of radiation exposure, or low radiation dose. When an exam is required to assess your health, it is important to remember that the benefits of the exam greatly outweigh any risk.

X-rays over your lifetime

The medical decision to have an x-ray exam weighs the likelihood of benefit against the potential risk from radiation. For exams that use a small amount of radiation (i.e., chest x-ray), this is generally an easy decision. Other imaging exams may use larger amounts. A radiologist may want to consider your history of radiation exposure before recommending a procedure. Computed tomography (CT), interventional radiology, and nuclear medicine exams may each use a modest amount of radiation. If you have had frequent x-ray exams and change healthcare providers, it is a good idea to keep a record of your x-ray history (https://www.imagewisely.org/~/media/ImageWisely%20Files/IW%20Medical%20Imaging%20Card_F.pdf) for yourself. This can help your doctor make an informed decision. It is very important to tell your new doctor, the imaging technologist, or radiologist if you are pregnant before having an exam that uses radiation.

You may have heard news stories about studies that show a link between having imaging exams and developing cancer. There are many limitations with these studies. For instance, some studies about CT scans:

- do not provide direct radiation exposure measurements for each patient
- do not give the reason the patient had the scan
- lack the beneficial information derived from the imaging scan

Also, many experts question the way the study authors use statistical models for judging the radiation risk involved. Some experts argue the study authors' methods have too much uncertainty for the results they report. Regardless of the disagreement, the studies are valuable in the sense that they raise awareness of how important it is to minimize a patient's radiation exposure. This has led to many advancements in medical imaging. These advancements have reduced radiation exposure while still providing high quality images necessary for diagnosis.

It is important to know why you need an imaging exam and to discuss which exam will best answer the medical question at the lowest radiation dose. Many medical imaging procedures have no or very low radiation dose. Your doctor or radiologist can discuss the benefit of detecting an immediate, and potentially life-threatening disease or injury versus the concern about a future risk of cancer.

See the Radiation Dose in X-ray and CT Exams (https://www.radiologyinfo.org/en/info/safety-xray) page for more information about radiation dose.

Copyright© 2026, RadiologyInfo.org

References:

1. Pearce MS, Salotti JA, Little MP, et al., Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. Lancet. 2012; 380: 499–505.
2. Mathews JD, Forsythe AV, Bardy Z, et al., Cancer risk in 680 000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians. BMJ 2013; 346:f2360.
3. Huang WY, Muo CH, Lin CY, et al., Paediatric head CT scan and subsequent risk of malignancy and benign brain tumour: A nation-wide population-based cohort study. British Journal of Cancer (2014), 1–7 | doi: 10.1038/bjc.2014.103.

Pregnancy and x-rays

Knowing that a patient is or could be pregnant is important information for your doctor. Pregnancy, for example, might explain certain symptoms or medical findings. When a pregnant patient is ill or injured, the doctor will carefully select medications to avoid potential risks to the developing child. This is also true of exams that use radiation.

Most x-ray exams do not pose a serious risk to the developing child of a pregnant woman. However, as with any medical procedure, there is always a risk for complications. The actual risk depends on how far along the pregnancy is, the type of x-ray imaging, and the area of the body under examination. X-ray exams of the head, arms, legs and chest do not usually expose an unborn baby directly to x-rays. Typically, the x-ray technologist will take special precautions to ensure that an unborn baby is not directly exposed.

Sometimes pregnant patients need exams of the abdomen or pelvis. Ultrasound is typically used if the purpose of the exam is to monitor the fetus. Ultrasound does not use x-rays and poses no known risk to the pregnancy. If the doctor cannot use ultrasound to answer questions about your health concern, other forms of imaging may be used. When possible, the type and method of imaging exam will be carefully chosen to minimize the amount of radiation exposure to the baby. It is important that you tell the doctor and the x-ray technologist if you are pregnant or breastfeeding before the exam is performed.

Some advanced abdominal and pelvic imaging exams deliver greater amounts of radiation to a developing pregnancy. Advanced imaging may be necessary to answer questions regarding your health. These exams include computed tomography (CT), nuclear medicine, and fluoroscopy exams. Nuclear medicine exams are different than CT and fluoroscopy imaging, which deliver radiation from the outside. In nuclear medicine exams, the patient usually swallows, inhales or is injected with a material that emits radiation (radiotracer) to produce the image. For nuclear medicine procedures, women who are breastfeeding should take special precautions. Some of the radiotracer can pass into the mother's milk and on to the child during breastfeeding. It is important to tell the doctor and the technologist if you are breastfeeding before the exam—preferably at the time of scheduling. Certain precautions must be taken and special instructions given for breastfeeding mothers.

Different forms of imaging provide different information about your health. It is important to tell the technologist or radiologist that you are or might be pregnant. This allows your doctor to plan your medical care with both you and your baby in mind. Remember, this is done to reduce any potential risk and optimize your medical care.

For additional information about CT exams see the CT During Pregnancy (https://www.radiologyinfo.org/en/info/safety-ct-pregnancy) page.

For additional information about nuclear medicine exams see "Safety in nuclear medicine procedures" below.

Radiation dose from interventional radiology procedures

Interventional radiology procedures use imaging equipment to assist doctors in treating patients. These procedures frequently provide favorable medical results with minimal recovery time. In some cases, these procedures can eliminate your need for conventional surgery or improve your prospects for a favorable outcome from surgery. As with any medical procedure, there are associated risks. The nature of these risks depends on the specific procedure.

Copyright© 2026, RadiologyInfo.org

Many interventional radiology procedures use radiation. The level of risk will depend on the type of procedure. Some use very little radiation, while complex procedures use more. In general, the health risks from radiation exposure are not a major concern when compared to the benefits of the procedure. Some procedures (such as those used to open a partially blocked blood vessel) require substantial use of radiation. However, these procedures frequently save lives. The amount of radiation used depends on the complexity of the procedure. Again, the risks associated with the radiation are generally considered minimal compared to the need for an interventional radiology procedure. In very rare cases, a patient may develop skin damage as a result of the procedure. As with any surgical procedure, these rare events are important to be aware of, particularly if the procedure could be difficult. Since the risk for such complications depends on individual circumstances, your doctor should discuss these possibilities with you.

Ultrasound (http://www.radiologyinfo.org) imaging is sometimes used for interventional radiology procedures. Ultrasound uses high frequency sound waves to create images and does not use x-rays (radiation). Ultrasound is considered safe when used appropriately. Magnetic resonance imaging (MRI) also may be used for some interventional radiology procedures. MRI does not use x-rays, so there is no radiation risk. MRI uses a powerful magnetic field, radiofrequency pulses and a computer to produce detailed pictures. There are certain risks associated with MRI, but it is considered safe when safety procedures are followed. *See the Magnetic Resonance Imaging (MRI) Safety (https://www.radiologyinfo.org/en/info/safety-mr) page for more information.*

Safety in nuclear medicine procedures

Nuclear medicine is a branch of medical imaging. It uses small amounts of radioactive material to help determine the presence and extent of conditions such as cancer, heart disease, or other abnormalities.

Depending on the type of exam, the radioactive material, or radiotracer, may be injected into a vein, swallowed, or inhaled as a gas. The radiotracer accumulates in the body area under examination, where it gives off energy in the form of gamma rays. A special camera captures this information and allows the doctor to view important information about the structure and function of organs and tissues.

During nuclear medicine exams, patients are exposed to radiation from the radiotracer. They may be exposed to additional radiation, depending on the imaging method used during the procedure. The exact amount of radiation exposure can vary, based on the patient's size and body area under examination. However, the doctor will use the lowest dose possible to obtain the highest quality images.

Nuclear imaging exams can be performed safely on children and pregnant women when the benefits outweigh the small associated radiation risk. When performing such exams, careful evaluation should be done to ensure proper/optimal dosage is given. Women should always tell their doctor and technologist if there is any possibility that they are pregnant and whether they are breastfeeding.

For additional information about nuclear medicine see the General Nuclear Medicine (https://www.radiologyinfo.org/en/info/gennuclear) page.

Disclaimer

This information is copied from the RadiologyInfo Web site (http://www.radiologyinfo.org) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at **http://www.radiologyinfo.org** to view or download the latest information.

Note: Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

Copyright

This material is copyrighted by either the Radiological Society of North America (RSNA), 820 Jorie Boulevard, Oak Brook, IL 60523-2251 or the American College of Radiology (ACR), 1891 Preston White Drive, Reston, VA 20191-4397. Commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is prohibited.

Copyright ® 2026 Radiological Society of North America, Inc.