

# Radiology procedures and applications (ct, mri, ultrasound, fluoroscopy)

[Health & Medicine](#), [Nursing](#)



## **Introduction**

Radiology is the use of medical imaging procedures in the “ diagnosis and treatment of disease” (Merriam-Webster Medical Dictionary, n. d.). A diagnostic radiologist may work alongside physicians to properly choose necessary exams or to consult technologists, while interventional radiologists perform minimally invasive procedures with the aid of imaging to diagnose and treat patients (“ What Is a Radiologist?”, n. d.). Radiology procedures are essential to various branches of medicine including “ surgery, pediatrics, obstetrics, cancer-care, trauma-response, [and] emergency medicine” and allow physicians to quickly and accurately treat patients (“ What is radiology?”, n. d.).

## **Computed Tomography (CT)**

A computed tomography scan, or CAT scan, involves the rotating of a thin x-ray beam around the patient and the use of small detectors to analyze the X-rays that pass through the targeted area. The signals produced are processed by a computer to construct cross-sectional images that may be used to construct a three-dimensional image of the patient (“ Computed Tomography (CT)”, n. d.). A CT provides physicians with detailed images of internal organs, tissues, bones, and/or blood vessels in order to possibly identify various cancers, internal injuries, tumors, and/or clots (“ Computed Tomography”, n. d.). Albeit life-saving, CT scans also carry risks. Ionizing radiation produced from the x-rays has the potential to biologically affect the tissue of patients and, though the risk is small, possibly cause cancer.

However, the benefits of CT scans far outweigh risks. CT scans have provided

a way to quickly assess life-threatening injuries during emergencies and improve the diagnosis of cancer. CT scans also reduce the need for exploratory surgery and act as guides for common surgeries and treatment procedures (“What are the benefits of CT scans?”, 2018).

## **Magnetic Resonance Imaging (MRI)**

Magnetic resonance imaging is a non-invasive procedure where a strong magnetic field is created through the use of powerful magnets, in order to align protons within the body. A radiofrequency current is then pulsed through the patient, causing the protons to “spin out of equilibrium, straining against the pull of the magnetic field” (“Magnetic Resonance Imaging (MRI)”, n. d.). Once the current is turned off, protons realign with the magnetic field releasing varying amounts of energy contingent to their chemical state. Sensors measure the energy released and allow physicians to differentiate between types of tissues. Contrast agents may be utilized to improve imaging. MRI scans are typically used to analyze the soft tissues of the body and can be used to diagnose aneurysms, tumors, or other injuries within muscles, tendons, ligaments, nerves or the spinal cord.

MRI scans may pose some difficulties. Due to the strong magnetic field being utilized, precautions may need to be taken if the patient has implants.

Additionally, MRI scans tend to be more costly than x-ray procedures/ CT scans. However, unlike x-ray procedures, magnetic resonance imaging does not utilize radiation and does not pose the risk of causing cancer. MRI scanning allows physicians to safely diagnose and treat patients that require frequent imaging (“Magnetic Resonance Imaging (MRI)”, n. d.).

## **Ultrasound**

Ultrasound imaging produces internal body images through the emitting of high-frequency sound waves and the recording of their echoes. Ultrasounds are commonly used to analyze developing fetuses, internal organs, muscles, tendons, and blood vessels. Ultrasounds are typically non-invasive, however, some procedures occasionally require the insertion of a probe into the vagina “(for some obstetric or pelvic examinations), [the] rectum (for some prostate examinations) or [the] esophagus (for some heart examinations)” (“Ultrasound scan”, 2019). In other cases, ultrasounds are utilized as guides for invasive procedures such as biopsies. Ultrasounds may require an empty stomach or a full bladder for accurate results but otherwise, ultrasounds pose no difficulties or risks. Due to the lack of risks and the minimal cost of ultrasounds they are easily and widely utilized (“Ultrasound scan”, 2019). They allow physicians to safely diagnose and/or treat a variety of conditions.

## **Fluoroscopy**

A fluoroscopy procedure involves the continuous passing of an x-ray beam through the targeted body part of the patient. The procedure is implemented in the study of the “skeletal, digestive, urinary, respiratory, and reproductive systems” of the body (“Fluoroscopy Procedure”, n. d.). It’s often used in biopsies, cardiac catheterizations, lumbar punctures, and/or the placement of intravenous catheters. It also allows physicians to locate foreign bodies, carry out injections, or guide therapeutic procedures (“Fluoroscopy Procedure”, n. d.).

Due to the use of x-rays, the patient's exposure to radiation through the fluoroscopy procedure may cause health issues. These health issues include skin or tissue injury, and in more serious cases, the development of cancer. Additionally, contrast dyes used within the procedure may induce allergic reactions ("Fluoroscopy", 2019). However, the procedure allows physicians to accurately diagnose conditions and contributes greatly to the success of treatments and/or surgeries.