

# [Radiology](https://assignbuster.com/radiology/)

Radiology
Humanity, constantly learning, growing,
and facing more challenges each second
of the day. Whether the challenges
are mental or purely physical. We have found more
efficient, safer, and easier ways of doing
the tasks we may face. From moving cargo, to
sending information via the Internet.

Probably the greatest accomplishments we have
made, are in the studies of medicine/treatment.

And to be specific, the study of radiology.

Radiology, the process of working and viewing
inside the human body without breaking the skin. By using radiant
energy, which may take the form of x rays or other types of radiation,
we are able to diagnose and treat many diseases and injuries. Both
diagnostic and therapeutic radiology involve the use of ionizing radiation
( Beta, Alpha, Gamma, and x rays), with the exception of the MRI, which
uses a magnetic field rather then radiation.

Radiology is classified as being either
diagnostic or therapeutic. Diagnostic radiology is an evaluation
of the body, by means of static or dynamic images or anatomy, physiology,
and alterations caused by injury or disease. A majority of these
pictures are formed by passing a low or high level of x rays through the
part of the body being examined, producing the static image on film.

This image is called a radiograph or x ray picture. The image it's
self may have many forms. It could be a common radiograph, such as
a chest x ray; a tomograph (Greek for " section"), which is a radiograph
obtained by timing the x ray exposure to correspond with the movement of
the x ray tube and film in opposite directions around the plane of the
body; or, finally, a computerized axial tomography (CAT or CT) scan.

Which is a computer analysis of a sharply limited, thin x ray beam passed
circumferentially through an area of the body, giving the doctor of Technician
a cross-sectional image. Much like that of slicing a loaf of bread
into sections.

Other images may be obtained by using ultrasound
or MRI, or by recording the activity of isotopes internally administered
and deposited in certain parts of our body. This practice is called
nuclear radiology or nuclear medicine. This include such techniques
as a PET scan, or positron emission tomography, which uses patterns of
the positron decaying to study metabolism reactions in the body. PET requires
a cyclotron as an on-site source of short-lived, positron-emitting isotopes.

The isotopes are injected into the patient along with a glucose related
compound, and the positrons collide with the electrons in the body
to produce photons. The photons are then tracked by a tomographic
scintillation counter, and the information is processed by a computer to
provide both image and data on blood flow and metabolic processes within
bodily tissues. PET scans are particularly useful for diagnosing
brain tumor and the effects of strokes on the brain, along with various
mental illnesses. They are also used in brain research and in mapping of
brain functions.

Another form of imaging is ultrasound.

Ultrasound, which uses very high frequency sound, is directed into the
body. And because the tissue interference's reflect sound, doctors
are able to produce, by use of a computer, a photograph or moving image
on a television. Ultrasound has many application uses on the body,
but is more commonly used in examinations of the fetus during pregnancy,
because use of radiation may affect the outcome of the baby. Some
other practices for ultrasound include examination of the arteries, heart,
pancreas, urinary system, ovaries, brain, and spinal cord. And because
sound travels well through fluids it is a very useful technique for diagnosing
cysts( which are filled with fluid), and fluid filled structures such as
the bladder. And since sound is absorbed by air and bone it is impossible
to use a ultrasound on bones or lungs.

The sound waves are produced by a random
oscillating crystal, and are inaudible to humans. A instrument called
a transducer is used to transmit the sound waves and receive the echoes.

The transducer must be in close contact with the skin, and a jelly like
substance is used to improve the quality of the transmission.

And last of the diagnostic imaging tools
is the MRI. MRI, which stands for Magnetic Resonance Imaging.

Was a technique developed in the 1950's by Felix Bloch, and is the most
versatile, powerful, and sensitive tool in use. The process of MRI
was originally called NRI (Nuclear Resonance Imaging), but was found to
be to confusing due to the fact that MRI's don't use radioactivity and
ionizing radiation. The MRI generates a very powerful electromagnetic
field, which allows the radiologist to generate thin-section images of
any part of the body. Also it can take these images from any direction
or angle, and is done without and surgical invasion. Another plus
side to the MRI is The time it take to perform, where as a CAT scan may
take 30-60 min. A MRI may only take 15 minutes max. The
MRI also creates 'maps' of biochemical compounds within a cross-section
of the body. These maps give basic biomedical and anatomical information
that provides new knowledge and may allow early diagnosis of many diseases.

The MRI is possible in the human body
because our bodies are filled with small biological 'magnets', the most
abundant and responsive of these are the protons (in the nucleus of the
hydrogen atom). The principal of the MRI, utilizes the random distribution
of protons, which have basic magnetic properties. Once the patient
is placed in the cylindrical magnet, the diagnosis process follows 3 steps.

First, MRI creates a steady state of magnetism in the body, that is 30, 000
time greater then that of the earth's own magnetic field. The rate
of absorption in the body is measure in megahertz and gigahertz ranges.

Then MRI stimulates the body with radio waves to change the steady-state
orientation of the hydrogen protons. It then Stops the radio waves
and 'listens' to the bodies electromagnetic transmissions at the selected
frequency. The transmitted signal is used to create images much like
those of the CAT scans, but are far more accurate and much easier to interpret.

In current practice, the MRI is preferred
for diagnosing most diseases of the brain and central nervous system.

And is the best diagnostic technique we know. It's images, information,
and other vital information surpass that of its relatives the CAT scans,
x rays, PET scans, etc. The MRI has yet another distinguishing feature
it can determine between soft tissue in both normal and diseased states.

The only drawback to the MRI is that is relatively expensive ($2, 000 dollars
session), but that may not be so bad when you account for all the money
and time you save by getting treatment and diagnosis sooner. Because
the MRI uses no radiation what-so-ever the only risk it presents is to
people who have one or more of the following: A pacemaker, neurostimulator,
implanted electrodes, pumps, or electrical devices, diabetic insulin pumps,
aneurysm clips, shunt, seizures, heart bypass surgery, abdominal injuries,
eye prosthesis, hearing aid, dentures, middle ear prosthesis, metal mesh,
wire sutures, war injuries or gunshot wounds, other known metal fragments
in head, eye, or body, known possible pregnancy, IUD's, penile prosthesis,
joint or limb replacement, fractured bones treated with metal rods, plates,
pins, screws, nails, or clips, any other for of prosthesis, permanent eye
liner, wig, or make-up with metallic fragments.

Many organs that may not be visible by
routine radiographic methods may become visible by ingesting, installing,
injecting, or inhalation of substances. These substances are called
contrast media, which are impenetrable by radiation. Exams involving
a contrast include the upper intestine, the colon, a arthrogram ( a injection
into a joint), myelogram ( an injection into the spinal canal), and an
angiogram ( a injection of the contrast into an artery, vein, or lymph
vessel). These procedures may be observed while the they are taking
place, by fluoroscopy. Which is a movable, radiation sensitive screen.

Now That I have described static images
and the processes used to create them let me explain dynamic images and
how they are manufactured. Dynamic images, which record movement
of organs or the flow of contrast material through blood vessels or spinal
canal, may be obtained be recording the image by fluoroscopy, or by recording
on to video tape or movie film (cineradiography). Both film and the
video tape are permanent recording media. The fluoroscopic image
on the other hand isn't. However, these images can be made permanent
( film spots), and can be made at any time during the examination.

The use of ionizing radiation in
the assessment of a disease is similar to the use of drugs and medication
in treatment of the disease. For the simple reason that radiographic
exams should only be performed for specific medical indications and only
on the direct request of a physician or another skilled professional.

And although diagnostic radiation dose levels do have a small risk potential,
no current evidence shows that properly conducted diagnostic exams have
no detectable adverse effects on our bodies. Dynamic images are used
quite frequently, but not as often as static images.

As I mentioned at the beginning of my report,
there are 2 sections of radiology. And since I just discussed diagnostic
radiology, it is time to explain a little about therapeutic radiology.

Therapeutic Radiology is used in the treatment of malignant diseases with
ionizing radiation, either alone or with drugs. This practice branches
off from the discovery of elements that occur naturally in the late 19th
century. Such treatment is often described in terms of energy of
the beam being used: superficial(less then 120 Kilovolts, orthovoltage
(l20 to 1000 kV), megavoltage (Greater then 1000 kV) Superficial
radiation is used in treatment of diseased skin, eye, or other parts of
the bodies surface. Orthovoltage therapy has almost been completely
replaced megavoltage(cobalt, linear accelerator, and betatron). Because
it provides more efficient delivery of the intended dose to tumors deep
within the body, sparing the skin and surrounding tissues as much as possible.

Radiation therapy may be used alone as
the treatment of choice in most cases of cancer of the skin; in certain
stages of cancers involving the cervix, uterus, breast, and prostate; and
in some types of leukemia and lymphoma, particularly Hodgkin's Disease.

In such instances, radiation therapy is intended to effect a cure.

But when is use with cancer-treatment drugs it may only pose as a relief
of symptoms. Radiation therapy is commonly used before and after
surgical removal of certain tumors, in order to provide a better chance
of cure.

The idea of radiation therapy is that normal
tissues have a greater ability to recover from the effects of the radiation
more so then tumor and tumor cells. Thus, a radiation dose sufficient
to destroy tumor cells will only temporally injure adjacent normal cell.

And if the ability of normal tissue to recover from a given amount of radiation
is known to be the same as or less then that of the cancer tissues, the
tumor is described as being radio-resistant. Such forms of therapy
are not considered an appropriate form of treatment.

Well, as you can see radiology is a field
of study that deserves our uttermost attention. For the future of
humanity may one day totally rely on these processes.