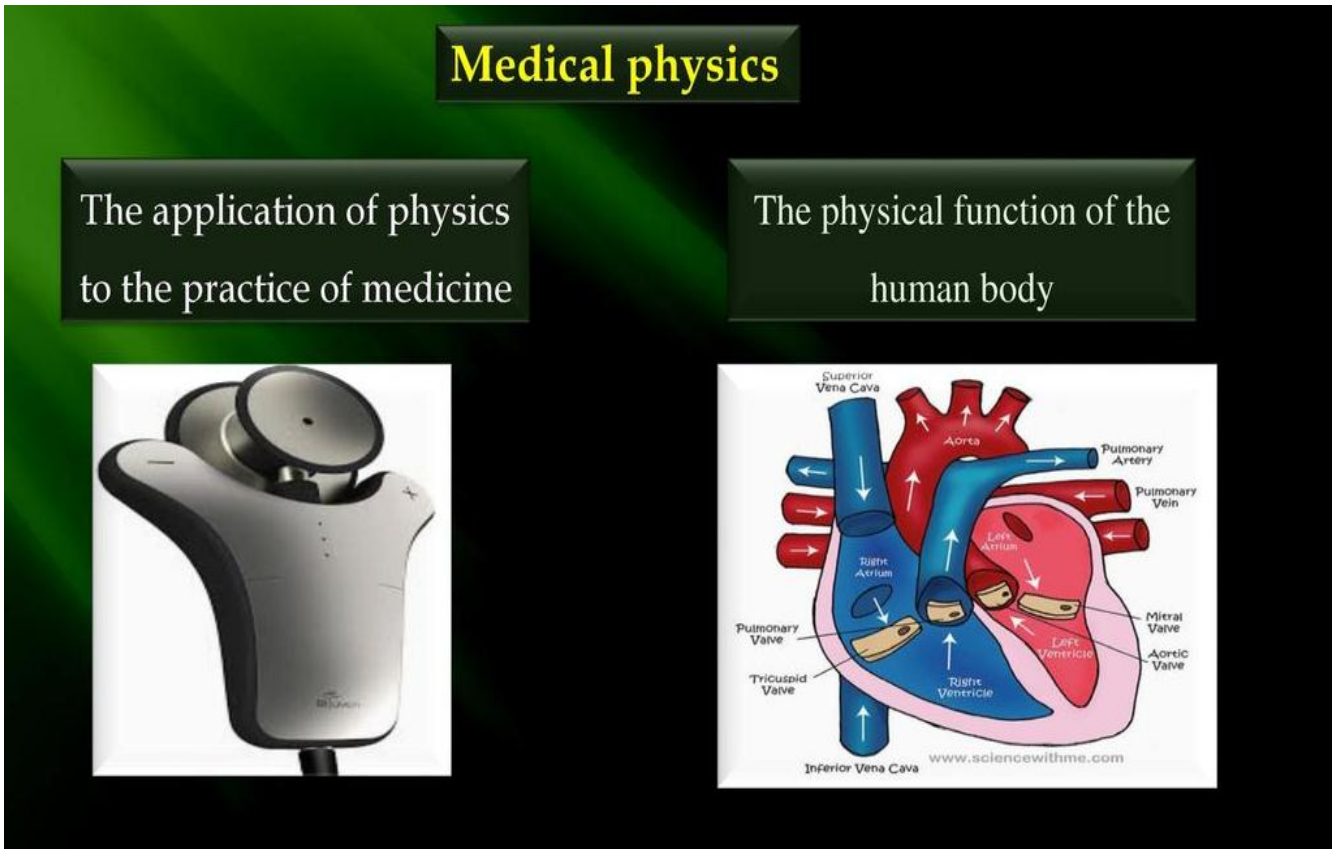
Terminology, modeling, and measurement

Medical physics (also called biomedical physics, medical biophysics, and applied physics in medicine, physics applications in medical science, radiological physics or hospital radio-physics) is, in general, the application of physics concepts, theories, and methods to medicine or healthcare.

As application, the term medical physics refers to two major areas: -

- The applications of physics to the function of the human body in health and disease.
- The applications of physics in the practice of medicine.



Medical physics is generally split into two major subgroups, specifically

a) Radiation therapy.

b) Radiology.

**Medical physics of* Radiation therapy *can involve work such as:*

1- Dosimetry.

2-Linac quality assurance. **(A medical linear accelerator (LINAC)**

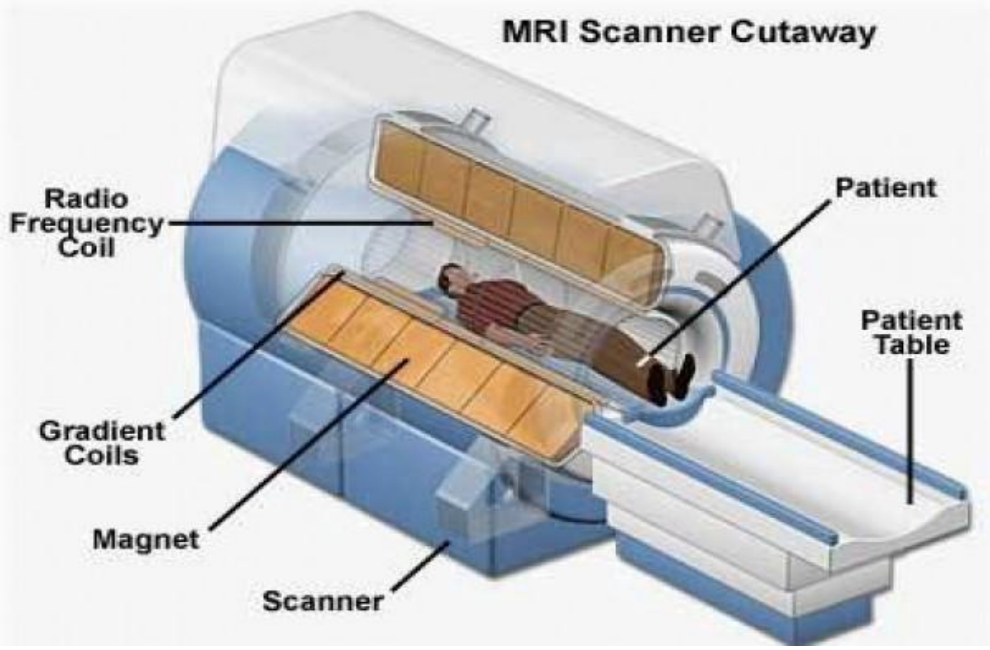
3-brachytherapy.

**Medical physics of* radiology *involves: medical imaging techniques such as*

1- Magnetic resonance imaging.

2- Ultrasound. 3-computed tomography.

4-positron emission tomography. 5- X-ray.



Mission statement of medical physicists.

In the case of hospital medical physics departments, the mission statement for medical physicists as adopted by the **European Federation of Organizations for medical physics** (EFOMP) is the following:

1-Medical Physicists will contribute to maintaining and improving the quality, safety of healthcare services through patient-oriented activities.

2-control and optimized clinical use of medical devices and regarding patient risks and protection from associated physical agents .Also including the prevention of unintended or accidental exposures.

The term "physical agents" refers to

1- Ionizing and non-ionizing electromagnetic radiations.

2- Static electric and magnetic fields.

3- Ultrasound.

4- Laser light.

5- Other physical agents associated with medical e.g.

a-X- rays in computerized (CT).

b- Gamma rays /radionuclides in nuclear medicine.

c- Magnetic fields and radio-frequencies in magnetic resonance imaging (MRI).

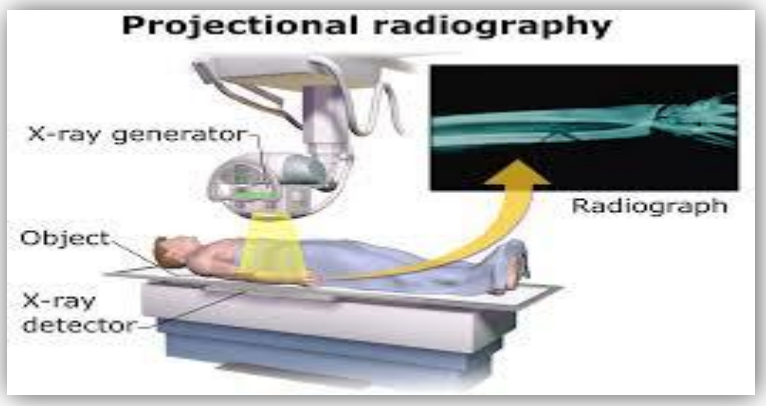
d- Ultrasound in ultrasound imaging and Doppler measurements.

Medical imaging physics.

Medical imaging physics is also known as diagnostic and interventional radiology physics.

- Clinical physicists typically deal with diagnostic radiology physics areas such as
  a- Radiographic X-ray .

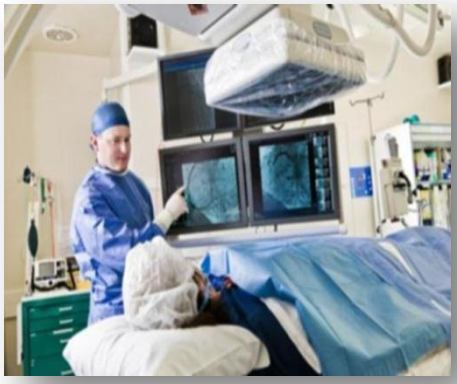
An X-ray gives only qualitative information about the inside of the body; a repeat X-ray taken with a different machine may look quite different to the ordinary observer.



b- Fluoroscopy.

c- Mammography.

d- Angiography.

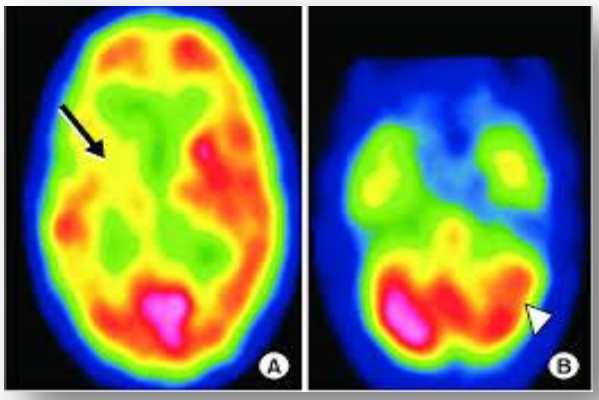


e- Computed Tomography.

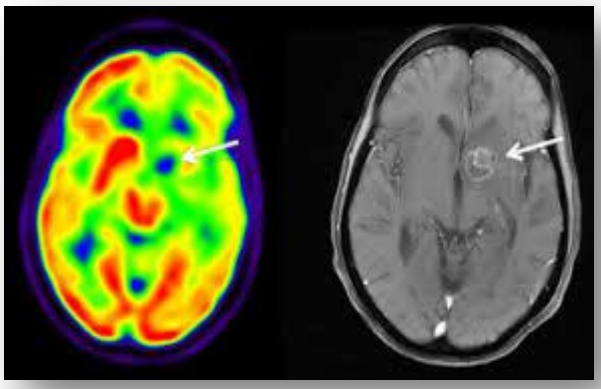
f- Non-ionizing radiation modalities such as ultrasound, and MRI.

- In addition, many imaging physicists are often also involved with nuclear medicine systems, including

  a- Single photon emission computed tomography (SPECT).



b- Positron emission tomography. (PET).



Radiation therapeutic physics

Radiation therapeutic physics is also known as radiotherapy physics or radiation oncologist physics. A radiation therapy physicist typically deals with

a- Linear accelerator (LINAC) systems
b- kilovoltage x-ray treatment units .

c- As well as other modalities such as tomotherapy, gamma knife, proton therapy, and brachytherapy.

Nuclear medicine physics

Nuclear medicine is a branch of medicine that uses radiation to provide information about the functioning of a person's specific organs or to treat disease. The thyroid, bones, heart, liver and many other organs can be easily imaged, and disorders in their function revealed. In some cases radiation sources can be used to treat diseased organs, or tumors. The most common radioisotope used in diagnosis is technetium -99m, with some 30 million procedures per year, accounting for 80% of all nuclear medicine procedures worldwide.

Health physics

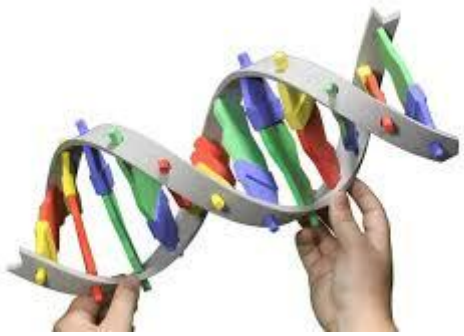
Health physics is also known as radiation safety or radiation protection. Health physics is the applied physics of radiation protection for health and health care purposes. It is the science concerned with the recognition, evaluation, and control of health hazards to permit the safe use and application of ionizing radiation.

Modeling

Scientific modeling, the generation of a physical or mathematical representation of a real phenomenon that is difficult to observe directly. Scientific models are used to explain and predict the behavior of real objects or systems and are used in a variety of

Scientific disciplines, ranging from medicine, physics and chemistry to encology sciences.

- **The purpose of scientific modeling varies. Some models, such as the three-dimensional double-helix model of DNA, are used primarily to visualize an object or system, often being created from experimental data. Other models are intended to describe an abstract or hypothetical behavior or phenomenon.**



For Example: -

Three- dimensional models of proteins are used to gain insight into protein function and to assist with drug design.