



# Medical Physics Services

## Our Mission

**is to deliver superior medical physics services to our clients at competitive rates. We are committed to staying at the leading edge of the medical physics industry and to offering the most recent improvements and innovations.**

# What is a Medical Physicist?

Qualified Medical Physicist (QMP) is an individual who is **competent to independently** provide clinical professional services in one or more of the subfields<sup>1</sup> of medical physics. The subfields of medical physics are:

**Therapeutic Medical Physics**

**Diagnostic Medical Physics**

**Nuclear Medical Physics**

**Medical Health Physics**

# Subfield-Diagnostic Radiology

Diagnostic Radiological Medical Physics:

Use of low energy radiation-producing machines to generate high quality images for diagnosing disease.



**Purpose:** Good diagnostic image , with all necessary information for the doctor , BUT dose As Low As Reasonably Achievable (ALARA) for the patient.

There are international and national protocols of Quality control to achieve this.

# What we offer

## Use of Physics and Imaging Principles

- Quality Assurance (QA) and Quality Control (QC) tests
- Personnel training
- Radiation dose and effects in patients
- Best Use of machines that acquire clinical images

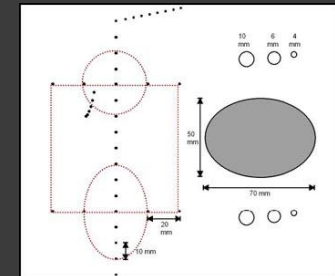
# Examples of Machines

- General x-ray machines
- CT and MRI scanners
- Mammography x-ray units
- Dental x-ray units
- Ultrasound machines



# Do not forget...

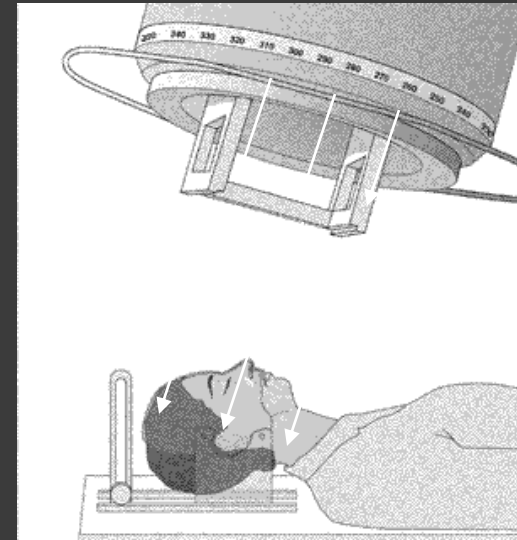
- MRI scanners and Ultrasounds also need QC checks to ensure good-valuable diagnostic image and patient safety.



# Subfield-Radiation Therapy

## Irradiation with high Energy rays

- Treatment of cancer by delivering intense beams of radiation to the disease site.
- The x-rays are generated by a linear accelerator (linac).
- **Purpose:** Give correct dose to the tumour to kill cancer cells , with minimal damage to surrounding healthy tissues.
- **The role of the physicist is crucial,** since every treatment needs specific planning and complicated calculations to be done (based on tumor type, shape, area anatomy etc.)



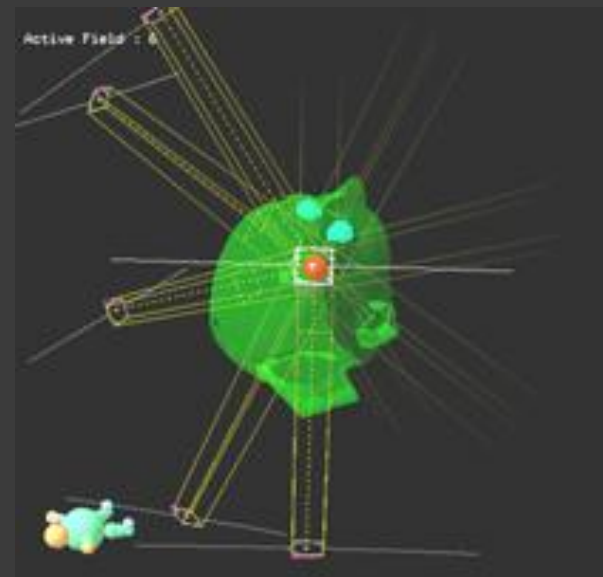


# Radiotherapy Treatment Planning

Every treatment using radiotherapy has to be rigorously planned. The planning process consists of three phases:

- ⦿ Planning
- ⦿ Simulation
- ⦿ Treatment

Generally speaking a medical physicist is always present at these departments...BUT he is always extremely occupied with everyday work load.



# What we offer

- ⦿ Acceptance testing
  - Perform radiation protection survey
  - Verify accelerator characteristics are within specifications
- ⦿ Commissioning
  - Collect and prepare beam data for clinical use
- ⦿ Quality Assurance
  - Daily ???, Weekly, Monthly, Annual



TIME IS MONEY  
under the linac

# Need for QA and Standards

## ◎ Most common hazards

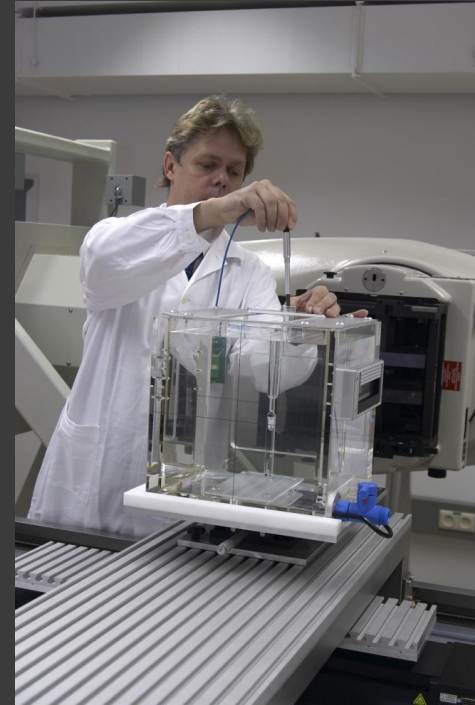
- Incorrect radiation dose
- Dose delivered to wrong region
- Collision between patient and machine
- Incorrect beam energy or modality
- Electrical/mechanical problems

- Two FDA classifications of hazards

- AAPM covers safety issues that the medical physicist should be aware of.

- Regulatory bodies  
Linear Accelerators  
National Council on Radiation Protection and Measurements (NCRP)  
Individual states and countries (Suggested State Regulations for Control of Radiation, SSRCR)

# Special Equipment needed (within the department)



# What is coming?

- New Techniques: Radiation Therapy is changing Rapidly (IMRT, IGRT, Rotational therapies). We can help at the implementation of new techniques within the department.



# Subfield-Nuclear Medicine

- Radioactive tracers can be used to see how well organs in your body are working or to find areas of disease.

e.g. radioisotopes of iodine or technetium.

- Often these are mixed with a drug that collects in a particular organ in the body.
- If we then inject the drug into the body, then by detecting the radiation, we can examine that organ.

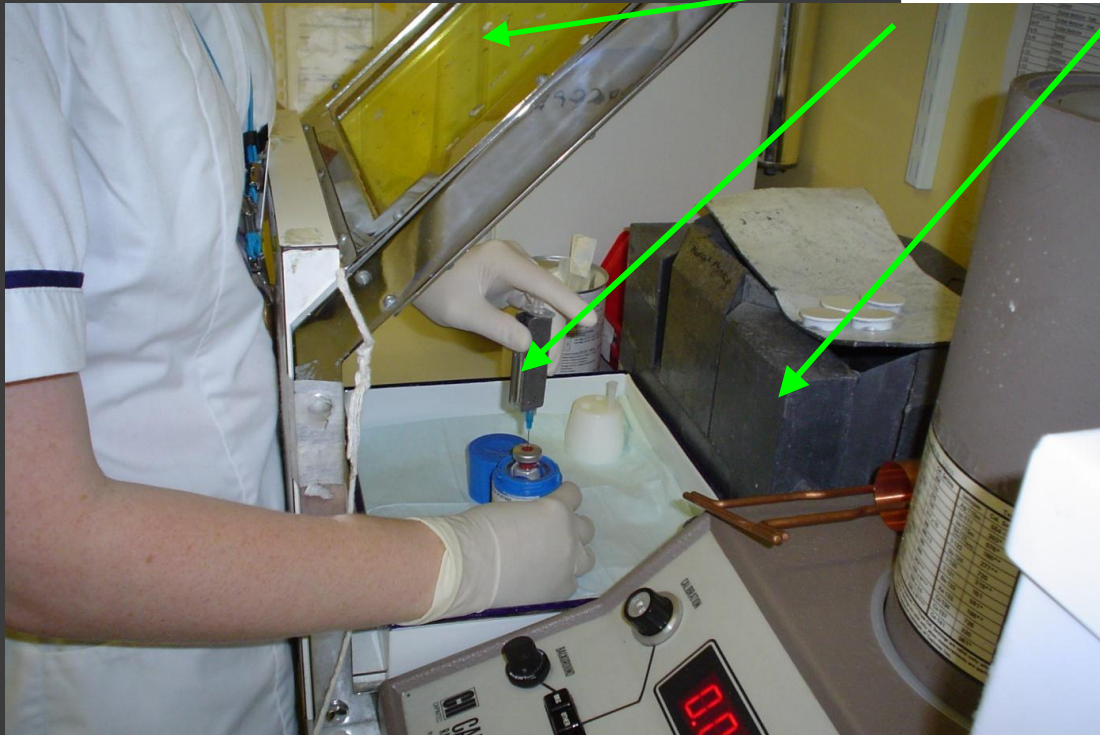




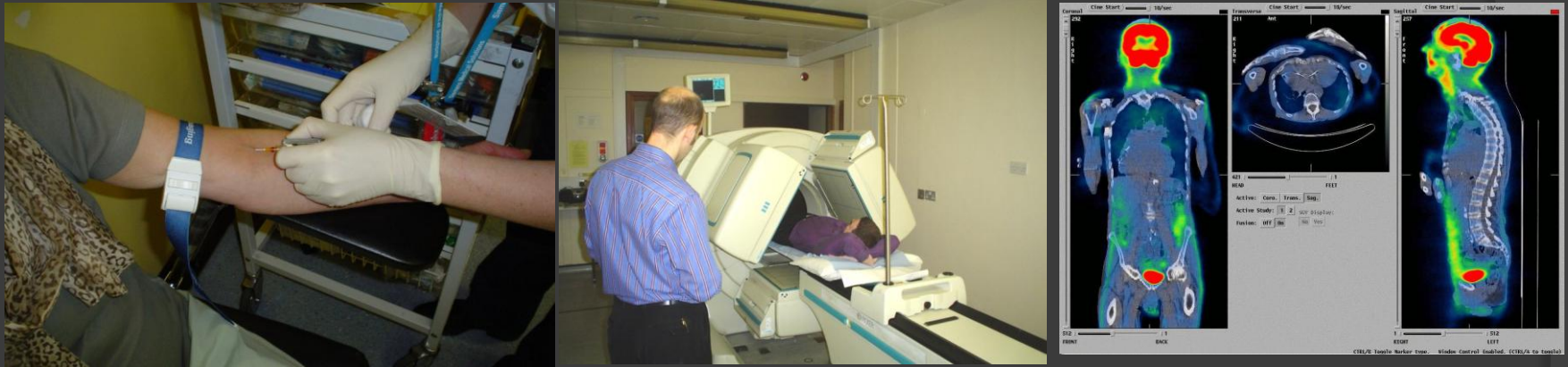
# Safety of personnel is Crucial!

Preparing the tracer

Lead



# The patient is a source of Radiation!



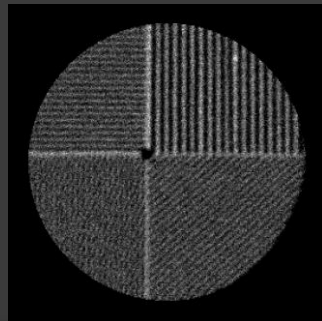
A gamma camera detects the radiation coming from the patient and produces an image of where the radioactivity is in the body.

**PET/CT is the new Technique: Even more radiation risks!**



# What we offer

- ⦿ **Gamma Camera QA/ QC checks**
- ⦿ **Dose Calibrator QC checks**
- ⦿ **Personnel Training**
- ⦿ **General radiation surveys**
- ⦿ **Advise on overall department organization-Procedures Standardization.**



# Subfield-Health Physics

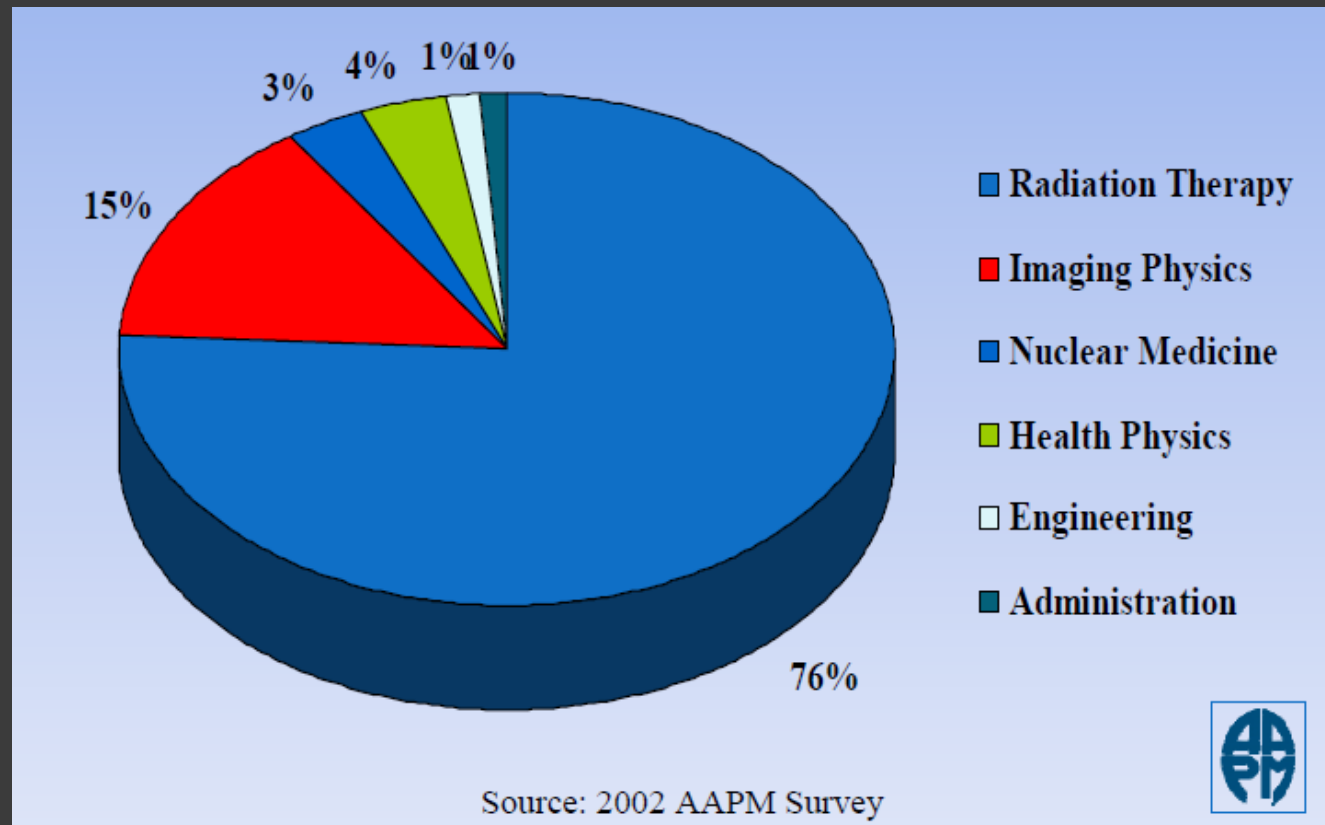
- ◎ Personnel dosimetry
- ◎ Radiation Surveys
- ◎ Personnel Training
- ◎ Emergency response protocols



# Need for Medical Physicists is rising!

- ⦿ Increase in the age of the baby boomer population will increase the cancer incidence rate and the need for medical examinations using radiation
- ⦿ Cancer incidence rises about 2% per year, more need for radiation therapy
- ⦿ Technology is booming in these fields right now and this requires more qualified physicists to test and implement new equipment.

# What is the Medical Physicist's Primary Discipline?





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