

**READING HOSPITAL SCHOOL OF HEALTH SCIENCES
MEDICAL IMAGING PROGRAM
RADIATION PROTECTION—2021**

RADIATION PROTECTION INTRODUCTION

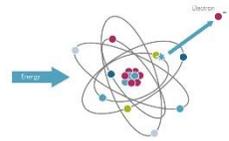
I. Introduction to Radiation Protection

a. Safeguards who from unnecessary exposures from ionizing radiation

1. _____
2. _____
3. _____

b. Ionizing radiation

- Produces + and – charged particles as it passes through matter



b. Unnecessary exposure

- Doesn't benefit a person in terms of:

1. _____
2. _____

c. How to minimize exposures

1. Proper Techniques examples:

2. Procedural Factors examples:

3. Human Determinants examples:

4. Environmental Determinants examples:

II. Justification of Exposures

a. Voluntary assumptions of risk- weigh positives and negatives

- Good voluntary risk is imaging for:

- 1.
- 2.
- 3.

b. Diagnostic Efficacy (basis for justification) definition:

III. Responsibilities

a. Technologist- quality patient care, quality images

- Standards of Practice
- ASRT Code of Ethics (#5 & #7)
- Technique
- ALARA
- Minimal repeats
- Proper shielding- reduces exposures

1. Females _____

2. Males _____

- Follow protocols
- Be educated

b. Radiologist/ Physician

- Consulting
- Do not order unnecessary Exams
- Trained radiologists

c. Employer

- Implement and maintain program
- Supply resources
- Written policy
- Exposure audit

IV. ALARA

a. Definition:

b. NCRP 1954

c. ORP definition (ICRP):

d. Radiation induced cancers are _____

V. Patient Education

a. Explain procedure

b. Explain follow up

c. Patient active participant

d. Answer questions

VI. BERT- Background Equivalent Radiation Time

a. Definition:

b. Helps explains exposures

c. Educates and reduces anxiety

VII. TRACE Program- Tools for Radiation Awareness and Community Education

a. Toshiba American Medical Systems 2010

b. Radiation awareness and reduction program

TABLE 1-1 Typical Adult Patient Effective Dose (EFD) and Background Equivalent Radiation Time (BERT) Values

Radiologic Procedure	EFD (mSv)	BERT (Amount of Time to Receive the Same EFD from Nature)
Dental, intraoral	0.06	1 wk
Chest radiograph	0.02	10 days
Cervical spine	0.1	2 wk
Thoracic spine	1.5	6 mo
Lumbar spine	3.0	1 yr
Upper GI series	4.5	1.5 yr
Lower GI series	6.0	2 yr
Skull	0.07	11 day
Hip	0.3	7 wk
Pelvis	0.7	4 mo
Abdomen	0.7	4 mo
Limbs and joints (except hip)	<0.01	<1.5 days
CT brain	2.0	1 yr
CT chest	8.0	3.6 yr
CT abdomen/pelvis	10.0	4.5 yr

Adapted from BF Wall: Patient dosimetry techniques in diagnostic radiology, WVK, UK, 1988; Institute of Physics and Engineering in Medicine, pp 53, 117; Cameron JR: Med Phys World, 15:20, 1999; Strain MG: Radiation protection and dosimetry: an introduction to health physics, New York, 2008, Springer.
CT Computed tomography; GI gastrointestinal; mSv millisievert.

VIII. Standard Dose Reporting

- a. Definition:

IX. Radiation

- a. Definition:

- b. Types (2):

- c. Electromagnetic Spectrum

- Definition:

- Ionizing

1. Examples:
2. High energy and frequency (short wavelength) that transfers energy and ejects electron from atom
3. Foundation of x-rays and human tissue
4. Valuable for imaging but can cause harm

- Nonionizing

1. Examples:
2. Low energy, low frequency (longer wavelength)
3. Does not have enough kinetic energy to eject electrons from atom

- Particulate Radiation-ionizing radiation that has high speeds

1. Alpha-emitted during radioactive decay from uranium/ plutonium
2. Beta- emitted from nuclei of radioactive atoms

3. Neutrons- neutral component of an atom

4. Protons- positive component of an atom

X. Sources of Radiation

a. Natural or Background Radiation- ~50%

- Terrestrial- 3%

1. From crust of earth

2. Depends on:

- Radon- 37%- colorless, odorless, radioactive gas present in the air

1. Higher levels in soil that contains:

2. Enters buildings through cracks or holes

3. Present in:

4. Higher in cooler months

5. Causes serious health issues- emits alpha radiation

6. _____ leading cause of lung cancer

7. _____ deaths in US in a year

8. EPA recommendations:

- Cosmic- 5%

1. Interaction with the:

2. Greatest intensity:

3. Lower intensity:

- Internal- 5%

1. Part of human metabolism

2. Radioactive atoms that are:

b. Man-made Radiation- ~50%

- Consumer product examples:

- Air travel

- Nuclear fuel

- Atmosphere fallout

- Nuclear plant accidents

1. TMI (1979)

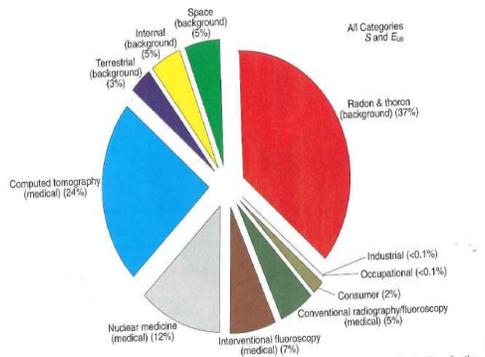
2. Chernobyl (1986)

- Thyroid cancer in adolescents and children
- Increase in breast cancer

3. Fukushima (2011)

- Medical radiation

1. Types:



As of 2006.....

- _____ percent of collective EfD from imaging
- _____ mSv exposure from medical exposures
- _____ mSv exposure from natural and background radiation