Radiation Protection

Review

MRT Program

Textbooks

- *Safety code 35: Safety procedures for the installation, use and control of x-ray equipment in large medical radiological facilities.*

http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php

- Statkiewica, S., Viscont, M. A., & Ritenour, E. R. (2018). *Radiation protection in medical radiography* (8th ed.). St. Louis, MO: Mosby Elsevier.

<u>Recommended</u>

- Bushong, S. C. (2017). **Radiologic science for technologists physics, biology and protection** (11th ed.). St. Louis, MO: Mosby Elsevier.

Safety at Clinical Practice

- Best Practices will be used at clinical practice.
- **Direct** supervision when exposing.
- Doors **shut** when exposing.
- **No one inside** the room during exposure.
- Only hold the rotor right before exposure.
- Wear your personal **dosimeter** at all times.
- An instructor must be with you at all times.
- Safety session will be provided.

Safety at Hospital Sites

- Hospital sites may have variations in safety procedures and may not be structured the same.
  - You need to know and follow the policies.
  - All policies should follow the *Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities (SC 35).*

Policy for Pregnancy

If a student becomes pregnant and is ready to declare the pregnancy:

- Contact the Radiation Safety Officer.
- All information will be kept confidential at the student's request.
- Precautions will be taken as per the SC 35.

Cardinal Rules of Radiation Protection

- Time
  - Reduce the exposure time.
  - If you are not needed in the room, leave.
- Shielding
  - Always shield the patient and technologist with radiation-absorbent lead.
- Distance
  - Keep as far away from the radiation source as possible.

Four Main Aspects of Radiation Protection

1. Patient should not be subjected to unnecessary radiation.
2. Essential that the patient is protected from excessive radiation during an exam.
3. Staff need to be protected from excessive radiation when performing their work-related duties.
4. Non-radiation staff and general public in and out of the department need to be adequately protected.

Radiation Protection

Radiation protection standards are set by international organizations including:

- International Commission on Radiological Protection (ICRP)
- United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)
- National Council on Radiation Protection and Measurements (NCRP)
- National Research Council of the National Academies–Biological Effects of Ionizing Radiation (NRC/NAS-BEIR)

Canadian Legislation

Government of Canada:

Radiation Emitting Devices Act and Regulations

Health Canada Safety Code 35

- Radiation Protection in Radiology - Large Facilities
  - Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities.
- You can find it online:
  - http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php

Principle Objectives of SC 35

- SC 35 always prevails over other texts in Canada.
- Its purpose is to:
  - Minimize **patient** exposure to ionizing radiation while ensuring the necessary **diagnostic** information is obtained and treatment provided.
  - Ensure adequate protection of **staff** operating X-ray equipment
  - Ensure adequate protection other **personnel** and the **general public** in the vicinity of radiation areas.

Safety Code 35

- In the SC 35 the words must and should have been chosen with purpose – explanatory notes
- Must
  - A requirement that is essential to meet the standards of protection.
- Should
  - An advisory recommendation that is highly desirable and should be implemented where applicable.

Main Sections of SC 35

- **Section A:**
  - Responsibilities & Protection
- **Section B:**
  - Facility & Equipment Requirements
- **Section C:**
  - Quality Assurance Program

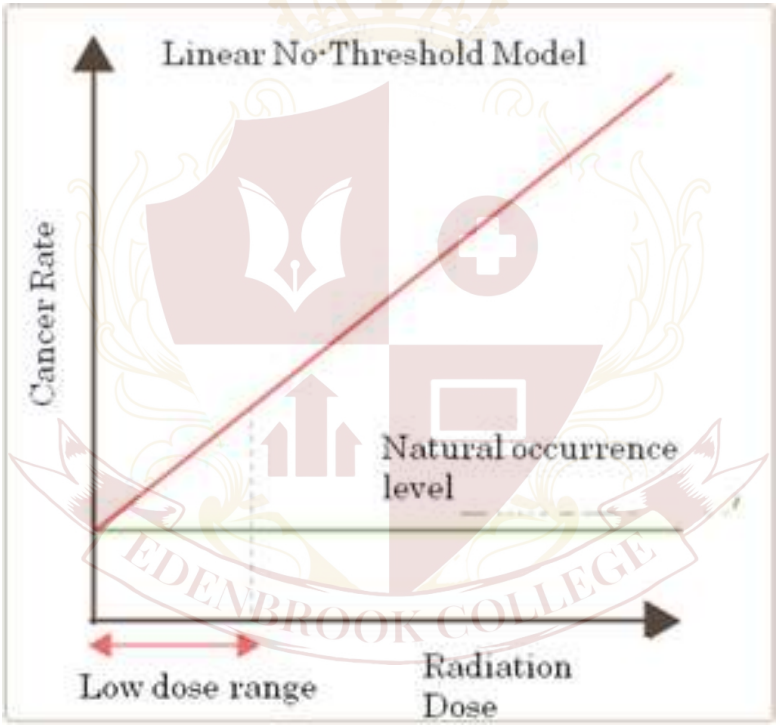
Safety Code 35 & Technologist's Role

- MRT responsibilities may include any of the subparagraphs within Section A: 1.2 & 1.3 depending on his or her role within the department.
  - 1.2 – Responsible User
    - Covers the entire scope of the responsibilities of medical radiation workers including general MRT.
  - 1.3 – X-ray Equipment Operator
    - Covers the scope of the responsibilities of the registered MRT.

ALARA Principle

- As Low As Reasonably Achievable (ALARA)
- Radiation risk model assumes that the health risk is proportionate to the dose.
- Linear non-threshold (LNT) hypothesis has been widely adopted in radiological protection and led to the ALARA principle.
- Low dose of radiation increases the risk minimally above background radiation.

Linear Non Threshold



ALARA and the Technologist

- Always wear your personal dosimeter
- Utilize protective barriers
- Fluoroscopy and mobiles wear a lead apron
- Reduce time in vicinity of radiation
- Distance from the source of the radiation is the most effective protection
- Proper use of patient immobilization devices(avoid holding patient)

ALARA and the Student

- Always wear your personal dosimeter in immersion lab and on practicum
- Utilize protective barriers, wear lead apron
- Reduce time and maximize your distance from the source of the radiation
- Limit repeat images and communicate
- Same rules apply to a student, plus:
  - Never expose without supervision
  - Questions? Unsure? ASK!
- There are no stupid questions when it comes to radiation safety!

ALARA and the Patient

- Restrict beam to area of clinical interest.
- X-ray beam should never exceed size of image receptor.
- Appropriate technical factors.
- Careful positioning to decrease repeats.
- Ensure exam is required.

Achieving ALARA

Three basic ways to keep the routine exam as safe as possible:

1. Controlling the power of the X-ray beam
   - Technical factors
2. Controlling the size of the field
   - Collimation
3. Lead protection
   - Patient
   - Technologist

Risk Management

- What are the radiation risks?
- Radiobiological risk (radiobiology)
  - Effect of ionizing radiation on biologic tissue.
- Purpose or goal of radiobiology:
  - Study of radiation damage on tissue.
  - To determine an accurate description of the effects on humans.
  - Ensure radiation is used more safely for diagnosis or more effectively in therapy.

Risk Management

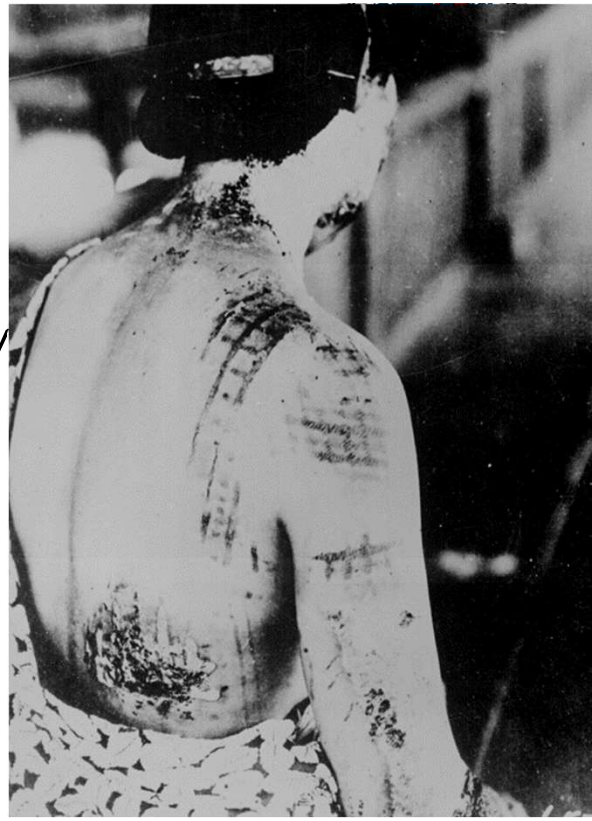
- Always use best practices and ALARA principles:
  - Patients
  - Caregivers
  - Technologists
  - Staff
- Always be an advocate for radiation safety:
  - Use protective and accessory devices
  - Inquire about pregnancy status as required
  - Consult with radiation or medical personnel if there is a question

Risk Management

- Always practice in accordance with legislation and regulatory guidelines, but ethics are very important.
- Practice patient care in a manner that protects patient's dignity and legal rights.
  - Privacy
  - Confidentiality
  - Lead protection
  - Communication
  - Proper documentation

Harmful Potential

- Ionizing radiation is harmful
- Radiation can cause harm in tissue
- Technologist must never forget the damage that can be inflicted w
- It's never "just an X-ray"



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Benefits of Radiation

- When used properly, radiation can offer:
  - Important diagnostic information.
  - Effective therapies.
- Provides information that allows for better patient management.
- Technologists are a vital part of the medical team and help save the lives of our patients.