Crenshaw Community Hospital

"Where Caring Counts"

Radiation Safety Orientation

Radiation protection may be defined as an effective measure employed by radiation workers to safeguard patients, personnel, and the general public from unnecessary exposure to ionizing radiation. Diagnostic medical x ray is the largest source of artificial radiation and accounts for 15 % of the total average effective dose of the population in the United States.

Health effects are known to be influenced by radiation characteristics and biological factors and include cancer induction, genetically determined ill health, nonspecific life shortening, developmental abnormalities, and degenerative diseases. Several factors can affect the probability and significance of potential effects, which are listed below.

- **Age** – Response to radiation differs with age. Children are more sensitive to exposure than adults.
- **Acute or Chronic Exposure** – Was exposure delivered over a short period of time or spread over an extended period?
- **Internal or External Exposure** – External means the source of radiation is outside the body and internal means the source of radiation was ingested, inhaled, absorbed, or injected.
- **What Part and How Much** – Was the exposure localized to a specific area?
- **Type of Radiation** – Forms of radiation differ in their penetrating power and ability to cause damage to biological tissues. In order from most sensitive tissue to least sensitive tissue are as follows: blood forming organs, reproductive organs, skin, bone and teeth, muscle, and nervous system.

We are going to address the three different types of exposure to ionizing radiation, which are somatic, genetic, and teratogenic effects.

Somatic effects are not usually seen in medical workers during the course of their work in the medical environment. Somatic effects can be acute or delayed. Acute effects include skin reddening, hair loss, and

radiation burns. Delayed effects include cataract formation and cancer induction that can occur months or years after radiation exposure.

Genetic effects do not produce any significantly observable effect in the exposed individual but may appear in descendants of the exposed individual. The effects may lie dormant for several years. It is unlikely that any worker in the medical environment would be exposed to ionizing radiation at a level high enough to cause genetic effects.

Teratogenic effects are those such as cancer and malformations. These effects can be observed in children who were exposed during the fetal and embryonic stages of development. If you are pregnant, or think you may be pregnant, it is of extreme importance that you are cautious when around any radiation source. Being exposed to radiation while pregnant could cause a smaller head or brain size, poorly formed eyes, abnormally slow growth, and metal retardation. The most sensitive time for a fetus is between the eight to fifteenth week after conception.

Exposure limits are set for people who are employed in the Radiology department. We have personnel monitoring devices that are worn at all times. If you are employed in the surgery department you will also have to wear a film badge where radiation exposure is a possibility. If you are assigned a badge you are the only person allowed to wear the badge. When not in use the badge should be stored in the assigned place away from radiation. When wearing the radiation monitoring device it must be worn at the collar level. When wearing a lead apron it must be worn outside the apron. If you have declared a pregnancy you will be assigned a second film badge that will be worn under the lead apron at waist level. This gives us a better idea about how much radiation the baby may have been exposed to. Exposure records come out once a month and are posted in their assigned areas in Radiology and in the Operating Room.

ALARA is put into place by all facilities that may have any employees that have the possibly of exposure to radiation. This helps us

to keep radiation the lowest achievable level by using protective equipment and following the principles of ALARA. ALARA stands for As Low As Reasonably Achievable. This concept applies to both internal and external exposure, as well as occupation and public exposure. There are three basic principles of ALARA, which are time distance, and shielding.

Time is the Radiation Dose Received = Dose Rate x Time. Therefore the least amount of time spent around radiation, the lower the dose, whether it be for a patient or healthcare team member. One way to help decrease time is to determine who needs to be present during a procedure. Only the people necessary to perform the exam should be in the room. Whenever possible, either step out of the room or behind protective barriers.

Increasing the distance between the individual and source of radiation is an effective method to reduce exposure to radiation. Doubling the distance from the radiation source reduces exposure by a factor of 4. Tripling the distance reduces exposure by a factor of 9.

Shielding is used either when time or distance are ineffective or as an additional exposure reduction strategy. A protective lead apron attenuates approximately 90 % of scatter radiation.

There are many risks associated with ionizing radiation. However, imaging procedures are important for determining appropriate treatment. Imaging professionals play a vital role in providing not only the images that assist with that treatment, but also the patient care to protect and educate the patient. As imaging modalities and the number of procedures continue to grow, it is imperative that radiographers use every means at their disposal to protect the patient, patient families, and co- workers, and themselves.

THE END!!