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Assignment :-

Radiation Protection

Submitted to :-

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Q No 1

Role of Radiation Protection officer in Radiology department.

ANS:-

Radiation Protection officer:- (RPO)

→ A Radiation Protection officer (RPO) is a specialist in radiation safty and complience matters and is an appointed position within Radiology department and Safety Services

Role of Radiation Protection officer:-

→ The role of the Radiation Protection officers (RPO) is to support with ionizing radiation by ensuring arrangments are in place to manage radiation risks.

→ So that the work is carried out safely and in compliance with regulations.

→ And so the department employes and the public

are protected from harmful effects of radiation.

Responsibilities of RPO:-

→ The RPO has a broad range of duties Some of which are given below

→ ALARA:-
Enforcing the "As Low as Reasonably acheiveable" doctrine.

→ Involvement in developing shielding Protocols

→ Auditing ALARA and RPP Programe on regular Schedule.

→ Routine reporting requirments

→ Preparing Periodic status reports on radiation and management.

→ Reviewing occupational and Patient close, Parameter, and establishing investigation levels

→ Establishing spills responce and contimantion protocols-

→ Advise on route of Radioactive waste disposal.

→ Reporting incidents to Proper Authorities-

→ Personnal instruction on raciation safty.

→ monitoring fitness and regulation of instrumentation-

→ Posting regulation notices, bulletins, required Procedure-

→ Performing measurment to cheeks radiation closes close rates and activity.

→ Controling and contribution to the production of local rules and local radiation safety policies.

→ Arranging for disposal of radioactive waste to authorized contractors.

→ Managing facility or site decommissioning

→ managing an inventory of equipment

capable of emitting x-rays.

→ Advising on training in radiation safety.

→ Large health care ~~instru~~ institution Generally full time RSO, while in small organization however the RSO may ~~serve~~ serve dual role.

→ Investigating incidents and report incidents when appropriate to the relevant regulatory Authority.

Q No 2

Radiation Protection measure in Radiology department:-

ANS:-

Radiation Protection:-

→ Radiation protection is the science and practice of protecting people and the environment from the harmful effects of ionizing radiation.

OR

The protection of people from harmful effects of exposure to ionizing radiation, and the means for achieving this.

Radiation Protection measure:-

Following are the radiation protection measure in safe Radiology department.

(1) The radiology depart-ment has documented and implemented safty plan:-

(1) → There is a safty plane that indicates the periodic inspection, maintenance and calibration of all equipment

→ The safty plan involves Posting of safty warnings on the doors

→ The safty plan indicates monitoring of the staff for radiation protection exposure at least "Quarterly

→ The safty plan involves the provision and regular testing of "Radiation protection aprons and thyroid and Gonad shields for staff and patients

→ Records are available indicating "The radiation dosimetry tools" and staff radiation exposure for the past twelve month.

Radiation Exposure:-

→ The risk of exposure should balance the medical benefits.

→ optimize radiation close by exposing

the Patient "only to enough radiation" to get clear image.

→

Radiation protection:-

(1) Minimize exposure.

→ Remember to "minimize you exposure" at all possible times.

(2) Measure your Radiation Dose. (Dosimeter)

→ use to "measure the occupational close" equivalent from x-ray, gamma, and High energy beta emitters

→ Always practice "ALARA" (As Low as Reasonably Achievable)

(3) Three Effective Strategies :-

→ Time
→ Distance
→ Shielding

Time :-

Minimize the time and you will minimize the close.

Pre plane :-

The procedure to minimize exposure time

Distance:-

Doubling the distance from the source can "Reduce your exposure intensity" by 75% (inverse square Law)

→ Know the radiation intensity where you perform most of your work, and move to lower dose areas during work delays.

Shielding:-

Position Shielding between yourself and the source of radiation at all permissible times.

→ Take advantage of Permanent Shielding i.e - equipment or existing structures.

→ Select appropriate shielding material during the planning stages of the procedure.

Room Shielding:-

→ Lead lined plaster Board

→ Lead glass viewing window

Radiation Protection in x-ray:-

→ Lead aprons attenuates scattered radiation by 95%.

Summary:-

→ Shield thyroid and gonads, always wear lead aprons and use closimeter to monitor the exposure.

→ CT scans should be more justified

→ Patient education is important.

→ There should be a universal x-ray bank where patient x-ray can be accersible anywhere from any hospital.

So these are the safty measure in which is necessory for safe Radiology department.

Q NO 3

Radiation Hazards

ANS:-

Hazard:-

→ A Hazard is a natural or man made event which may cause physical damage, economic losses or threaten human life and well being.

→ Ionizing radiation is generally considered

to be more hazardous to human health than non ionizing radiation.

→ Because it can remove electron from atoms-

→ This means that it can damage living tissue and DNA-

→ it strips away electron from atoms break some chemical bonds

→ like Alpha radiation

Beta, and gamma.

Example of Radiation:-

- x-rays
- Radio Waves
- Alpha
- Beta
- Gamma ionizing radiation
- Sunlight
- Heat.

Radiation exposure may be divided according to

(1) External Radiation exposure
(2) internal Radiation exposure.

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External Radiation

Exposure:-

Hazard is related to high penetrating radiation source outside the body.

Example:-

→ Electromagnetic Radiation

→ High energy beta and Neutron. That could penetrate the skin and body to cause harm the body.

Internal Radiation

Exposure:-

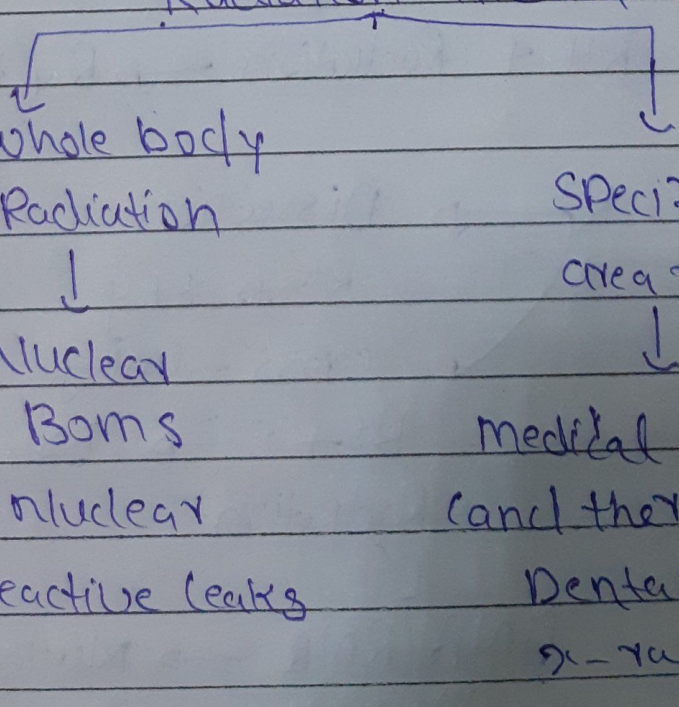
Hazards related to radiation

Radiation source in the body.

→ involve radiation with low penetrating power

Types of Radiation Hazard:-

→ Alpha Radiation
→ Beta Radiation
→ Gamma rays
→ x-rays
→ Neutron Particles.



Radiation Damage

Indirect → Somatic affects individual, no effect on obd spring

Direct → Genetic Do not effect individual offspring is effected.

Radiation Hazard

Direct Damage:-

$RH + Radiation \longrightarrow R^+ + H^+ + e^-$

R^+ → Dissection

$R^+ \longrightarrow x + y$

cross-linkage

$R^+ + S \longrightarrow RS$

Radiation → DNA/RNA molecule → Nuclear acid break down

→ Nluclear acid breaks down
→ Somatic cells
* Genetic cells

→ Radiation induced malagnancy

* Radiation induced
* Congenital abnormality

Radiation Hazard

indirect Damage:-

→ Radiation Hazard can cause indirect damage, which effect the individual not the obbspring.

→ It can effects the individual by water Hydrolysis.

Water Hydrolysis:-

Radiation

$H_2O \rightarrow H^+ + OH^-$

$H^+ + H^+ \rightarrow H_2$

$OH + OH^- \rightarrow H_2O_2$

$H_2O_2 + DNA$
$H_2O_2 + Protein$ → Molecule Break down

→ When the molecule Break down cell damage will be occur

Radiation Damage

Somatic:-

Direct

DNA/RNA Hit radiation induced malegnancy

indirect

H_2O_2 formation Toxic Break down of large molecule (Protein/DNA)

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Radiation Damage

↓

Genetics

Direct	in direct
DNA / RNA Hit	H_2O_2 Formation
Radiation induced	Toxic
Milagnancy	Breab down of
	Large molecule

→ The LD50/60 is the close of radiation to whole body that cause 50% of irradiated subject to die within 60 days

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Effect of Radiation on organism / tissue level

→ (A) Deterministic effect

→ Stachastatic effect
  → Carcinogenesis
  → Genetics effect

(A) Deterministic effect:-

→ It is are caused the cell death

→ If dose of radiation exposure is less than the threshold dose

Example:-
→ Death of individual
→ Damage of Skin
→ Damage of bone marrow
→ Cataracts

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Stochastic effect:-

→ Stochastic effect are caused by mutent cell

→ It may cause the effect of radiation if dose of radiation increases.

→ the probability of effect also increases

→ Stochastic effect means that even low level of radiation exposure do guaranted Safety

→ Example:-

→ Genetic influence

→ Carcinogensis

→ So these are the radiation Hazards that one Should be beware of it.

Q No 4

Radiologic Technologist Protection from radiation close and Annual close:-

ANS:-

occupitional radiation close management by Radiologic Technologists:-

→ The radiation close is measure Gyt (Rads) while exposure is measured in Cyta (Rontgens)

→ But the exposure is to radiologic due to

Longer beam on time for procedure

→ Extremily exposure often significant

→ Avoid bending Protection during procedure

→ Collimate as much as possible

mammography:-

→ Low Personnal exposure

→ Normal walls and barriers adequate

→ Dosimetry probably not required

→ occiptional close is the close of radiation to which radiological

staff exposure close during working in department

→ To minmize occupitional close, the cardinal principles of Radiation Protection should kept in mind.

→ Time

→ Distance

→ Shielding

Time:-

The amount of exposure on individual recieves is directly proportional to the time of exposure.

→ There technologists should minimize the amount of time spot with radiation source.

e.g:- Time of fluoroscopy procedure should kept to a minimum.

Distance:-

Distance has inverse relation

→ Doubling the distance from the source ~~with~~ will decrease the exposure by four.

→ X-ray, CT staff should out side the room behind the shielding when machine is on

→ Perform fluro from as far as practicable

→ Variety of restraining devices can be used for Patient immobilization

Shielding:-

Any objects between technologists and a source of radiation will provide with some shielding

→ The more dense an object or material the better will the shielding

→ The technologists must wear protective apron gloves, gonad shielding and other barriers

Radiation Safety by modality:-

Fluoroscopy:-

Personnal exposure directly related

to beam on time

→ technologists should use ALARA principles to reduce close

→ Protective apparatal must be worn during fluoroscopy.

Computed Tomography

→ Personnal exposure low

→ Collimated beam results in low Salter x-ray

→ Technologists should remain in room if necessary with lead aprons.

Mobile Radiography:-

→ Usualy low Personnal dose

→ Exposure cord long enough for technologists to be out of Sacttey area.

→ Beware of location of tube IR

→ Each mobile x-ray unit Should have Protective apron assigned to it

→ The exposure cord on a portable x-ray unit be at least 2m long

→ The useful beam should never be directed toward the operating consule.

occupational Radiation monitoring:-

Required ib worker expected to exceed 10% of annual limits (500mrem)

→ All machine user technologists require to wear dosimeters

Dosimetery:-

Calculate the exposure radiation

→ wear out side the apron

→ Dosimeter obbers no protection just record the radiation exposure

Female Radiological technologists:-

Ib the female technologist become Pregnant

→ In Pregnancy the Worker should limite exposure.

→ Concerned about exposure

→ Training Should to Pregnant Worker to inform her Potential risk and available option.

Patient Holdings:-

→ mechanical devices Should be used

→ If mechanical devices impractical then relative or friend should hold Patient

→ Check Protective barrier appareis etc each year for leak

→ And it cheak the closimeter Performance.

Radiation Worker

Risks:-

→ Bone cancer
→ kidney Cancer
→ skin cancer
→ Ung cancer
→ Bronchitis
→ Hair loss
→ Leukemia

Annual occupational dose:-

→ The recomanded annual occipectional dose is 0.5 SV/yr (500 mrem/yr)

→ But average radiologic personal dose per year is 0.7 mSV/yr for whole body exposure.

The end