SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Vision Tit 2 Vision Title 3

Course Name: 19BME301 – Medical Physics

III Year : V Semester

Unit V – BASIC RADIATION QUANTITIES

Topics to be Discussed

- Objective
- Principles of Radiation Protection
  - Justification
  - Optimization
  - Dose Limits
- Personnel Protective Devices
- Conclusion

Basic Principles of Radiation Protection

- Justification
- Optimization
- Dose Limits


justification
Risk
Benefit

KEY POINTS.....

Principle of justification :
Any decision that alters the radiation exposure situation should do more good than harm

Before the examination technologist must review the possible risks and benefits.

So the Practice must be **justified.**


How?
Why?
When?
optimization
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ALARA PRINCIPLE

(As Low As Reasonably Achievable)

The magnitude of individual doses , the number of people exposed and the likelihood Of repeatedly exposures from a justified application of Radiation must be kept ALARA Which means (As Low As Reasonably Achievable

ALARA Principles States that.,

TIME

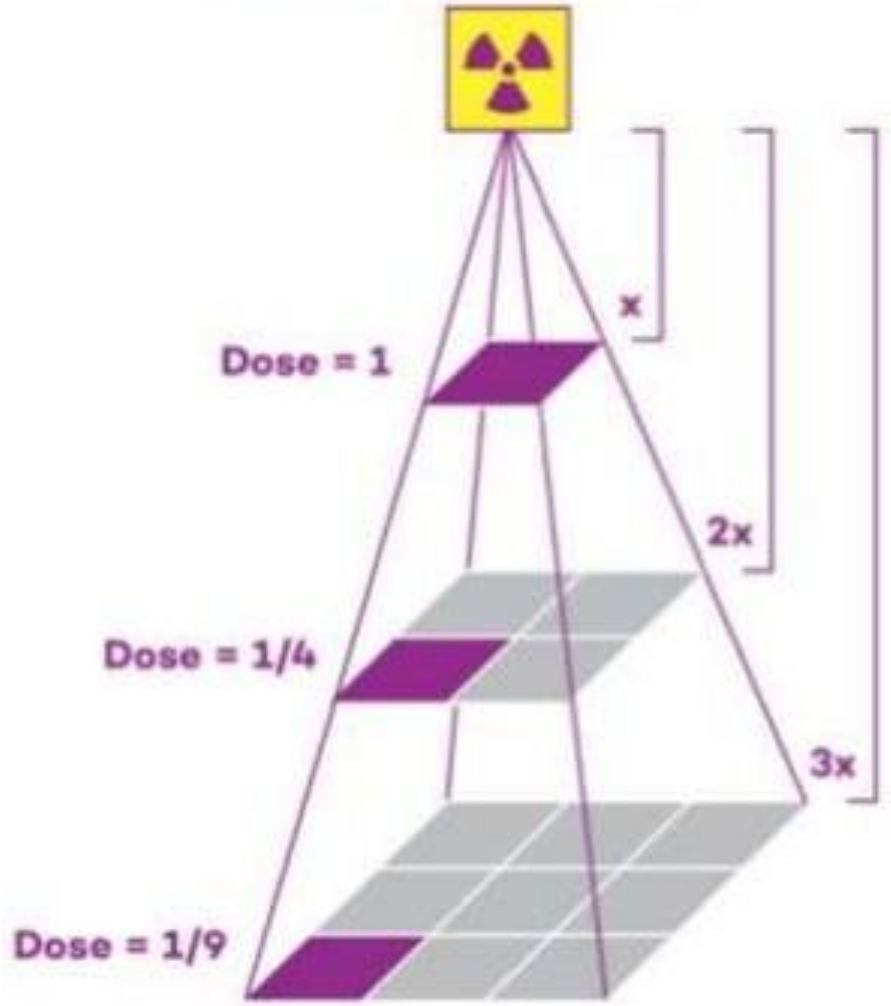
Increased Exposure time Results in Higher dosage to Patient as well as Radiographer

Less time spent

Near Source

Less Radiation Received

DISTANCE



By Doubling the Distance
Resultant dosage will
be reduced by the four

$$X_2 = X_1 \left[\frac{D_2}{D_1} \right]$$

The Law Explaining This is Known as Inverse

SHIELDING

By using Proper shielding materials which all are a blocking materials to ionizing Radiation

Typical shielding Materials are made up of Lead or lead equivalent materials

Rooms and Radiation areas are protected by Heavy concrete Materials

KEY POINTS.....

- The time should be **minimized** hence to reduce the Radiation dosage
- Keep distance always **away** from the radiation source
- Particularly only the region of interest only exposed to Radiation means all other Areas should be **shielded**
- The Radiographer or trainee should be in area which is shielded
- The room in which Radiological examination is performed should be safe for the public

dose limits

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

ICRP Recommended Dose limits

	Occupational	Public
Effective Dose (mSv/yr)	20	1
Equivalent Dose(mSv/yr) to :		
Lens of eye	150	15
Skin	500	50
Hands and Feet	500	-

Personnel Protective Equipments [PPE]

LEAD Aprons

It should have Lead equivalent thickness of 0.25-0.5mm

Lead Apron is made up of rubber material

to provide flexibility

When thickness increases Means it is more safe

It will not cover Arms ,Legs ,Head , neck and thyroid

Cont.....,

THYROID LEAD SHIELD

It is made up of lead and wraps around the person's neck

It offer protection similar to that of Lead Apron

Cont.....,

Gonad LEAD Shields

It is a kind of Organ shields

It can be provided to the patient to protect the Gonads from Primary beam The gonad shield should have a lead thickness of 0.5mm of Lead

Cont.....,

LEAD Goggles

It attenuates the X-rays about 30-70% depending upon lead content

LEAD Gloves

Protective gloves made up of 0.5mm lead thickness

Cont.....,

Ceiling mounted barriers

- They used in cardiac catheterization Labs and Interventional imaging works
- The devices are placed between patient and the personnel in the room
- The ceiling mounted system is counter balanced and easily positioned ,

Lead glasses

- lead glasses are often provided greater attenuation than lead aprons

Normal lead glasses used in the hospital may offer 20% attenuation

Conclusion

As Radiology Technologist You Should:

- ❖ Always Justify the Benefits to Risk ratio whenever Performing Study
- ❖ Optimize the Facilities and Factors in order to reduce DOSE
- ❖ Apply ALARA Principle Always
  - ✓ Spend Less time Near the Source
  - ✓ Keep Distanced always
  - ✓ Use shield and Shielding materials

You Should Provide :

- ➢ **Shielding Material such as Lead Apron, And shielding materials Depending upon study**
- ➢ **Also Provide Protection to Attenders who succeed the patient.**
- ➢ **Always try to take in One Attempt**
- ➢ **Use Proper Factors**

REMEMBER!!!!

SAFETY IS

GAINFUL

ACCIDENT IS

PAINFUL

Thank You