

Radiation Protection and Regulatory Requirements on use of Medical X-ray Equipment in **ORTHOPAEDICS**



Directorate of Regulatory Affairs & Communications
Atomic Energy Regulatory Board
www.aerb.gov.in

X-ray equipment used in Orthopaedics



Radiography unit



C-arm unit



Mobile Radiography unit



These equipment emit ionising radiation



Does ultrasound and MRI gives ionising radiation?

Non ionising
radiation

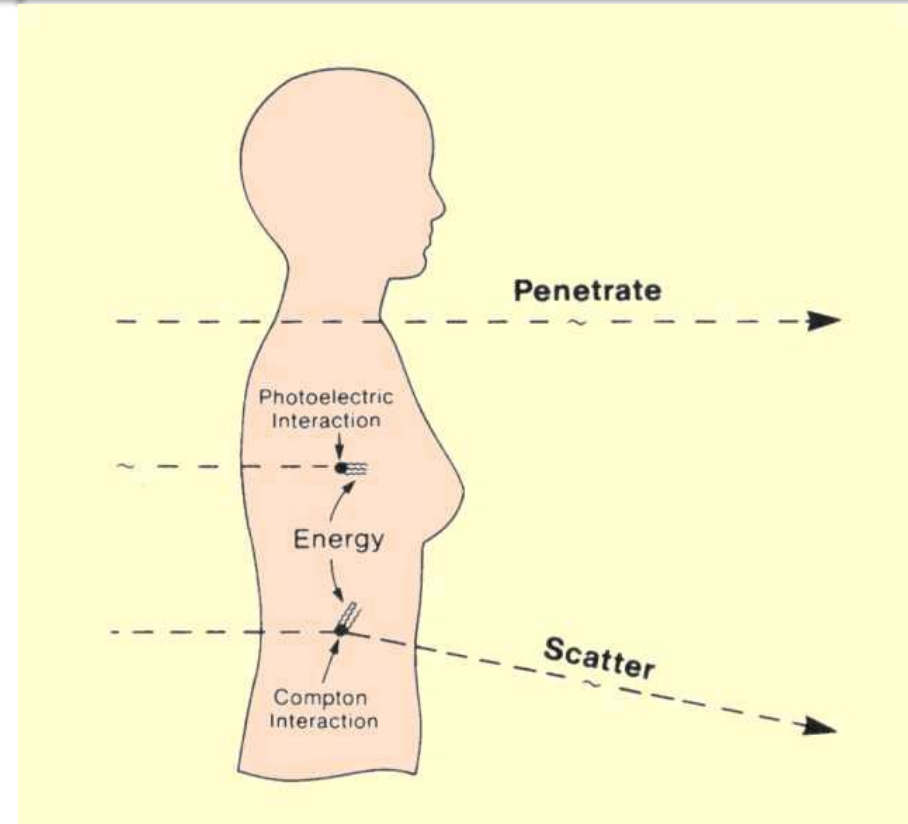
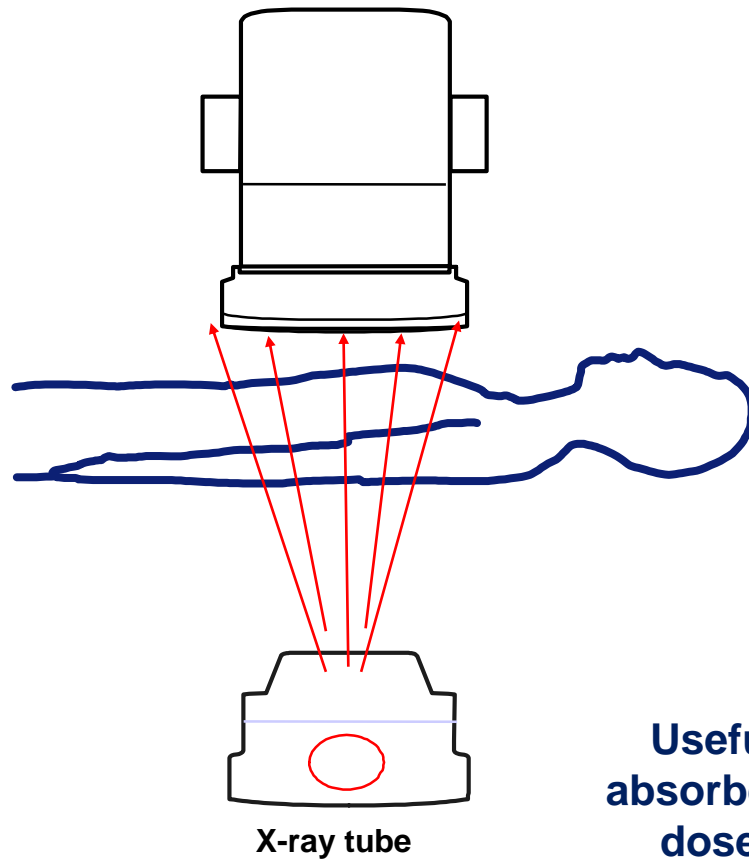


Ultra sound waves



Radio Frequency waves

Interaction of X-ray (ionizing radiation) with human body



Useful images with the X-rays that penetrate and absorbed, but X-rays absorbed contributes to patient dose. Dose to workers are with those scattered.

India, 2016: Reported Injuries to patient



1. Initial stages of injury from Interventional Radiology Procedure for Pelvic AVM : Injury consistent with the entry port of the radiation beam : Note the discoloration of skin in the posterior and Rt. Lateral pelvis



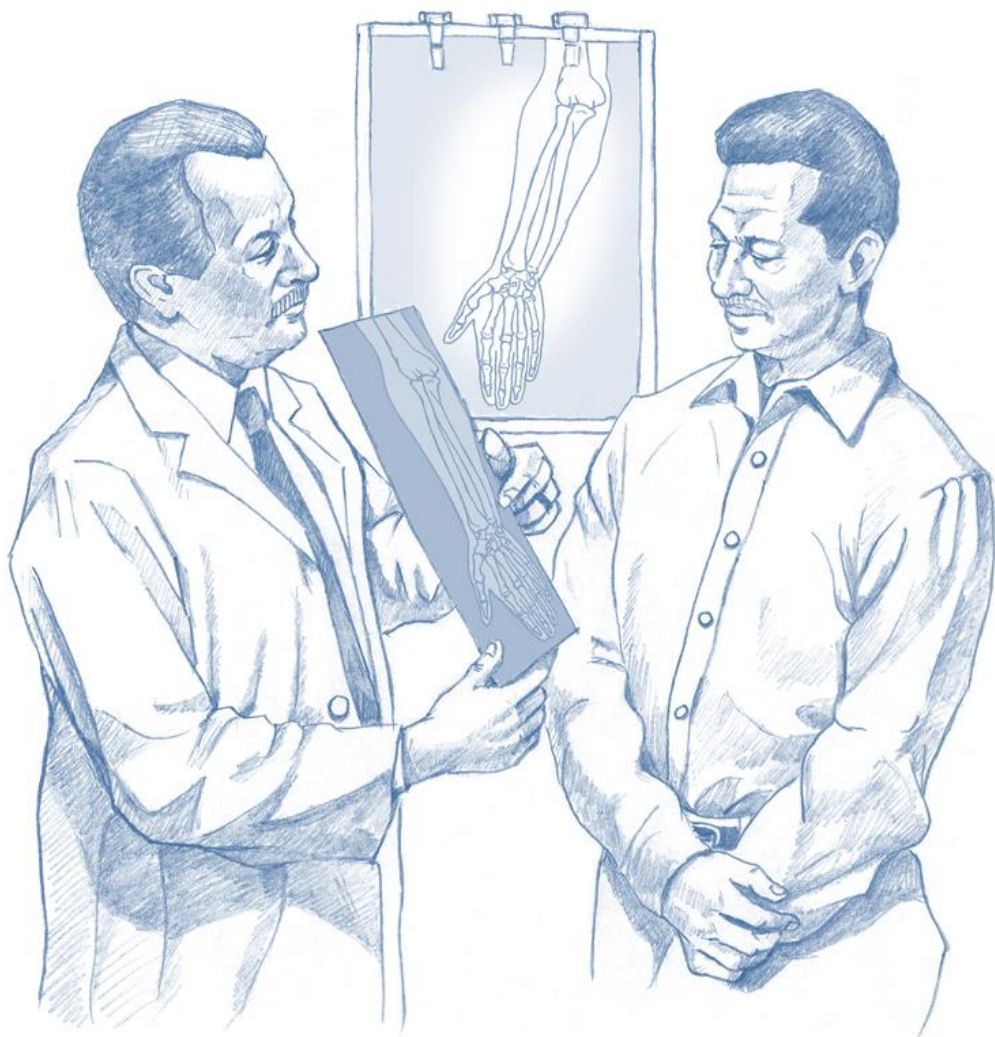
2. Rt Arm is exposed during the procedure

4. Injury in Rt. Gluteal region progresses to a non healing ulcer requiring skin graft



3. Arm injury progresses

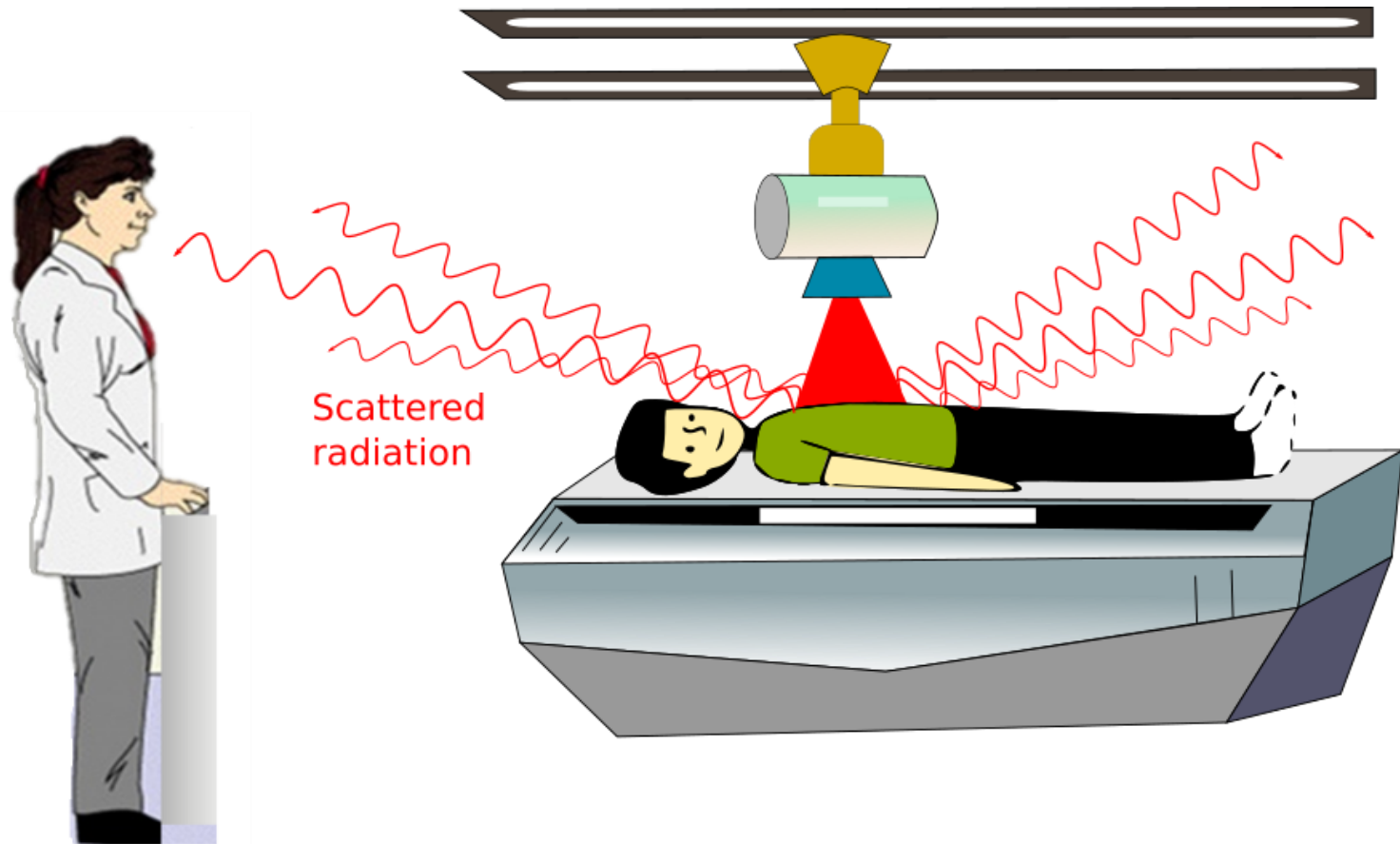
Justification for X-ray exposure to patient



Net benefit to
patient outweighs
the risk of
radiation hazard



What about radiation exposure to operator ?



Working in radiation field throughout their career

What about radiation exposure to the public?



For safe use of X-ray equipment, regulation is required

Applications of medical X-rays gives huge societal benefit

BUT

Health hazard is also associated with the use of medical X-rays



Atomic Energy Regulatory Board (AERB)

The mission of the AERB is to ensure the use of ionising radiation and nuclear energy in India does not cause undue risk to the health of people and the environment.



- AERB is a Government of India organization.
- Constituted in 1983.
- Regional Centers at New Delhi, Chennai and Kolkata



AERB Dose limits for operators

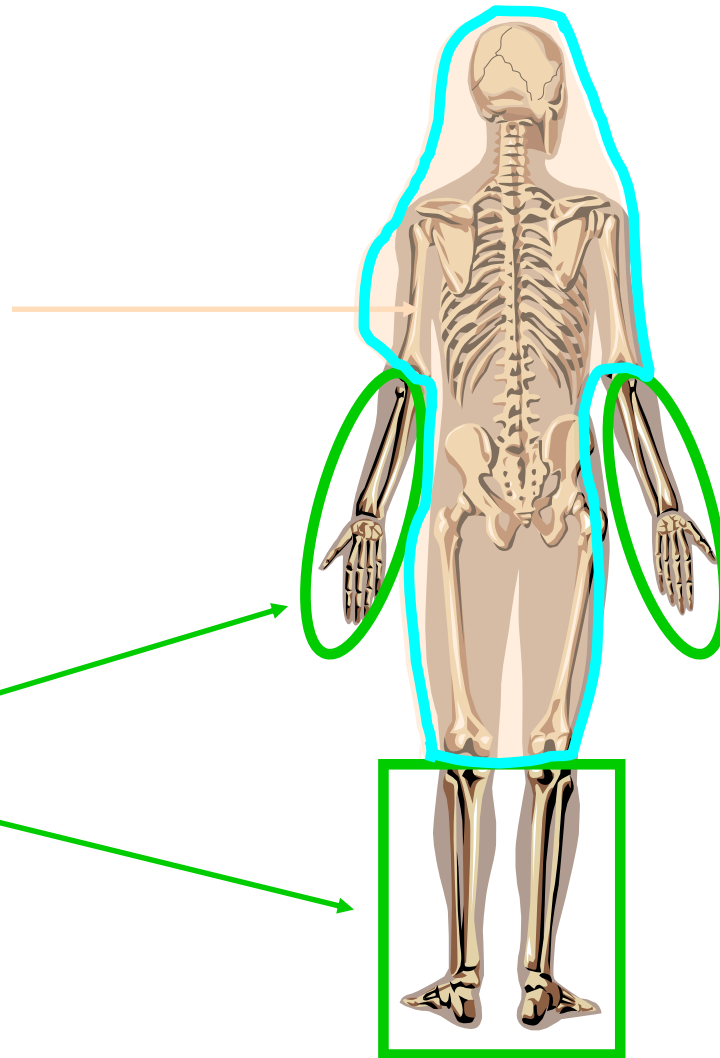
**Whole Body (everything except
extremities)**

30 mSv maximum per year

20 mSv averaged over 5 years

Extremities

500 mSv per year

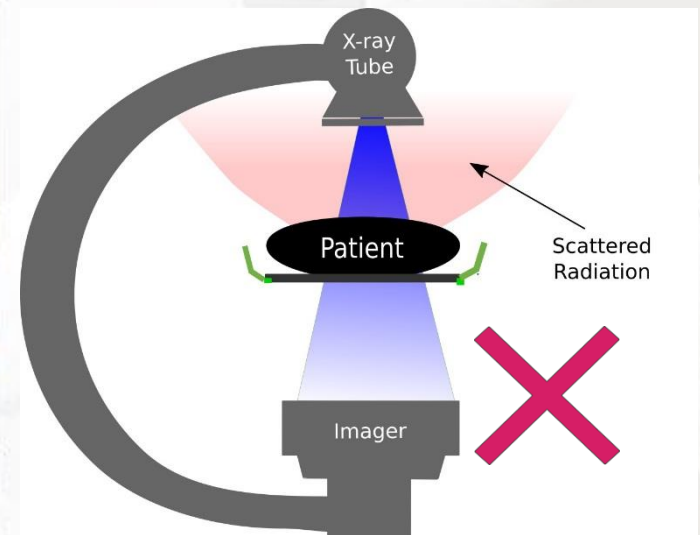


Imbibing radiation safety in Orthopaedics practice



Distance → C-arm orientation

Vertical under-couch orientation



Distance → C-arm orientation

Horizontal orientation



X ray tube

Image intensifier

Distance→Dose to the hands

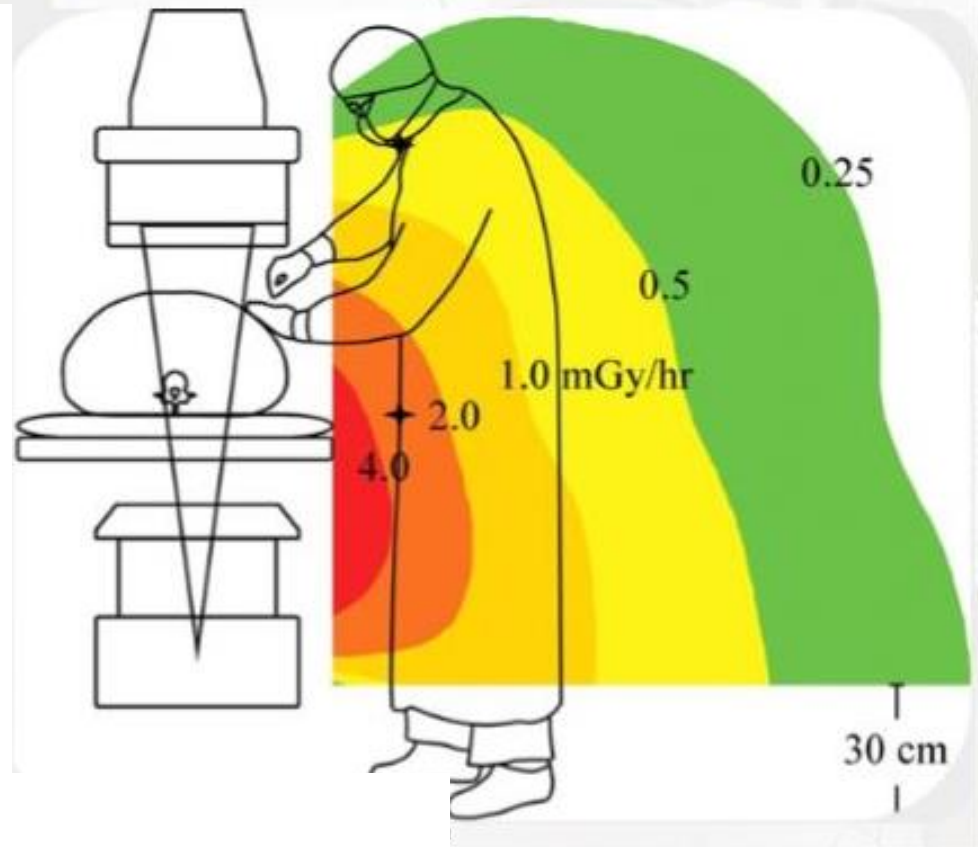
- Keep **hands outside** the area of the **primary beam**!
- If the hands need to be in the close proximity of the primary beam, **wear protective lead gloves**, unless doing so hinders the purpose of the procedure!



Distance ↔ Position of staff member

Maximize the distance to the radiation source!

Radiation level reduces
with distance



What AERB regulatory requirement says

Obtain Licence to operate the X-ray equipment safely.



What you need to ensure for obtaining Licence?

Ensure availability of safety accessories



Protective barrier



Lead apron

What you need to ensure for obtaining Licence?

Construction of Radiography (fixed) room to ensure adequate radiation shielding (9 inch brick wall and lead lined door).



NO LAY OUT REQUIREMENTS FOR C-ARM and MOBILE* X-RAY EQUIPMENT
(* provided equipment is not used as fixed radiography equipment)



What you need to ensure for obtaining Licence?

X-ray equipment shall comply with the QA tests prescribed by AERB



What you need to ensure for obtaining Licence?

Ensure availability of TLD badge to operators for monitoring the dose received



Exposures received above the stipulated limits

- In the past, reported many cases of exposures received above the stipulated limits of 30mSv that too in one quarter in Diagnostic Radiology practice.
- Typically 90% of these cases are non-genuine.
- Significant resources are expended by AERB for establishing the non-genuine/ genuine nature.
- AERB has taken up awareness of stakeholders in a big way.



Non adherence to AERB regulations

Non- adherence to AERB regulatory requirements may attract enforcement action such as sealing of X-ray equipment or issuance of warning for seal.



Many X-ray units were sealed or warning for seal was issued owing to non-adherence to AERB's safety regulatory requirement.



electronic Licensing of Radiation Applications (eLORA) System



Government of India
Atomic Energy Regulatory Board
e-Licensing of Radiation Applications (eLORA) System

हिंदी संस्करण | AERB Website



Guidelines for Institute Registration

Guidelines for Radiation Professional Registration

Licensed Diagnostic Radiology facilities in India and Type approved Medical Diagnostic X-ray equipment

Verification of Consent/Document issued through eLORA

Feedback

Submission of Over Exposure Investigation Report

Click here to submit Over Exposure Investigation Report-Applicable for Institutes not registered in eLORA.

Guidelines for Over Exposure Management for Unregistered Institutes and Standard Format for Attachments

Help Phone no:
022-25990675
(only during working hours and working days of AERB)

Help Email-Id:
See practice specific guidelines for concern help email id. (Practice specific guidelines are available in 'Help' menu after login to system)

CAUTION X-RAY

Ways to achieve Radiation Safety in

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13/05/2016 05:30 PM	Your Application ref no. 16-134637 is Rejected.
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22/01/2016 05:32 PM	You have successfully frozen Application For Site and Layout Approval with application no. 16-104840 for Accelerator,Precise Digital
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AERB Circulars

Submission of security plan for Telecobalt and Gamma Knife facilities

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Obtaining AERB Licence is easy through AERB's web-based system eLORA



For more information on radiation safe practice, refer to our hand-outs.



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Visit AERB website for information for doctors

