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

Mobile Radiography unit

C-arm unit

These equipment emit ionising radiation

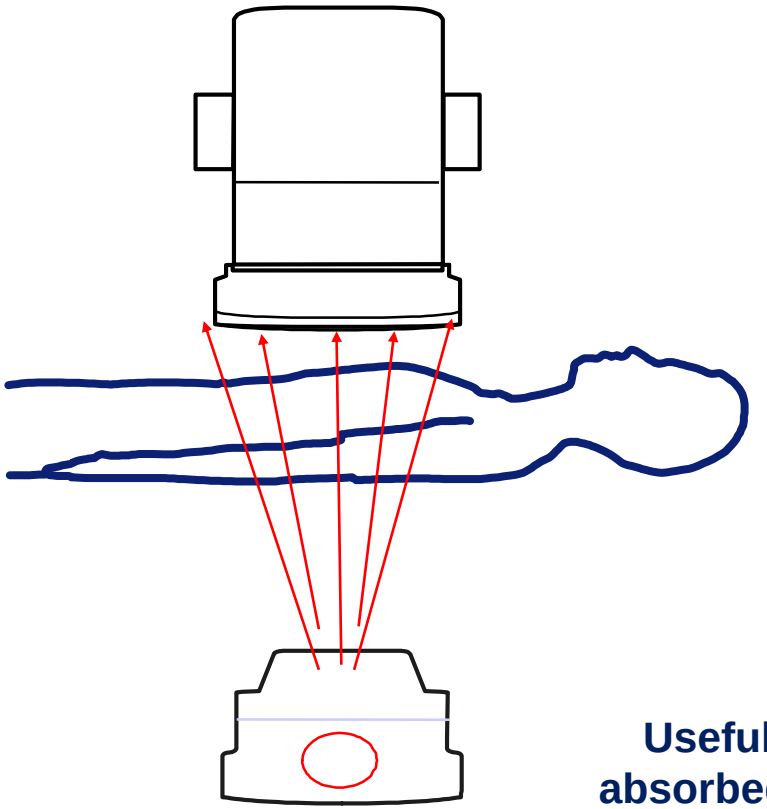
Does ultrasound and MRI gives ionising radiation?

Non ionising radiation

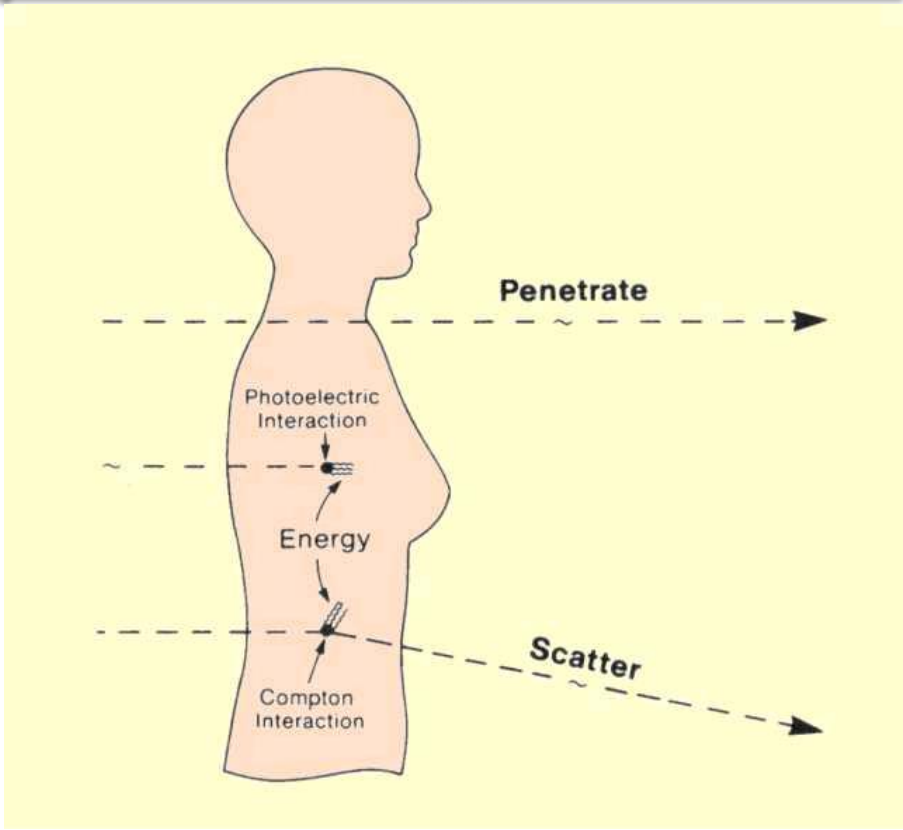
Ultra sound waves

Radio Frequency waves

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



X-ray tube



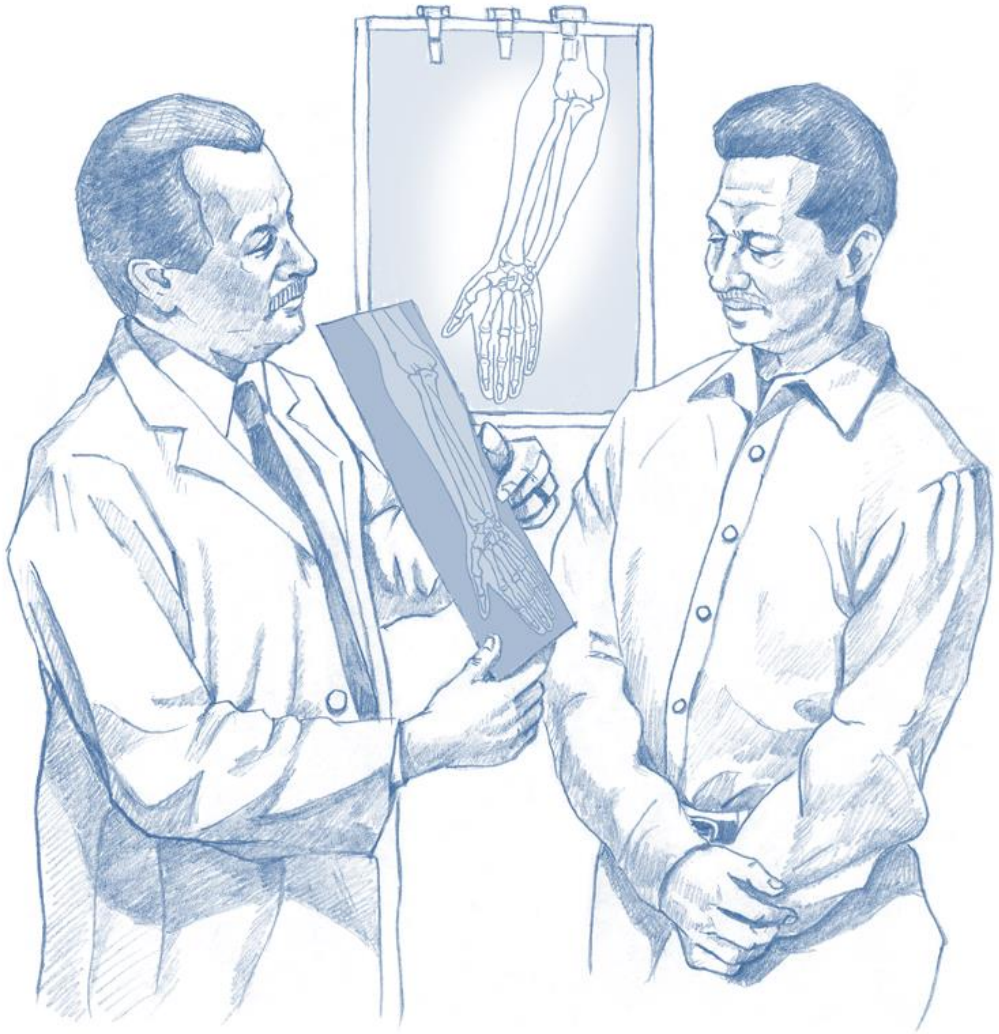
Useful images with the X-rays that penetrate and absorbed, but X-rays absorbed contributes to patient dose. Dose to workers are with those scattered.

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

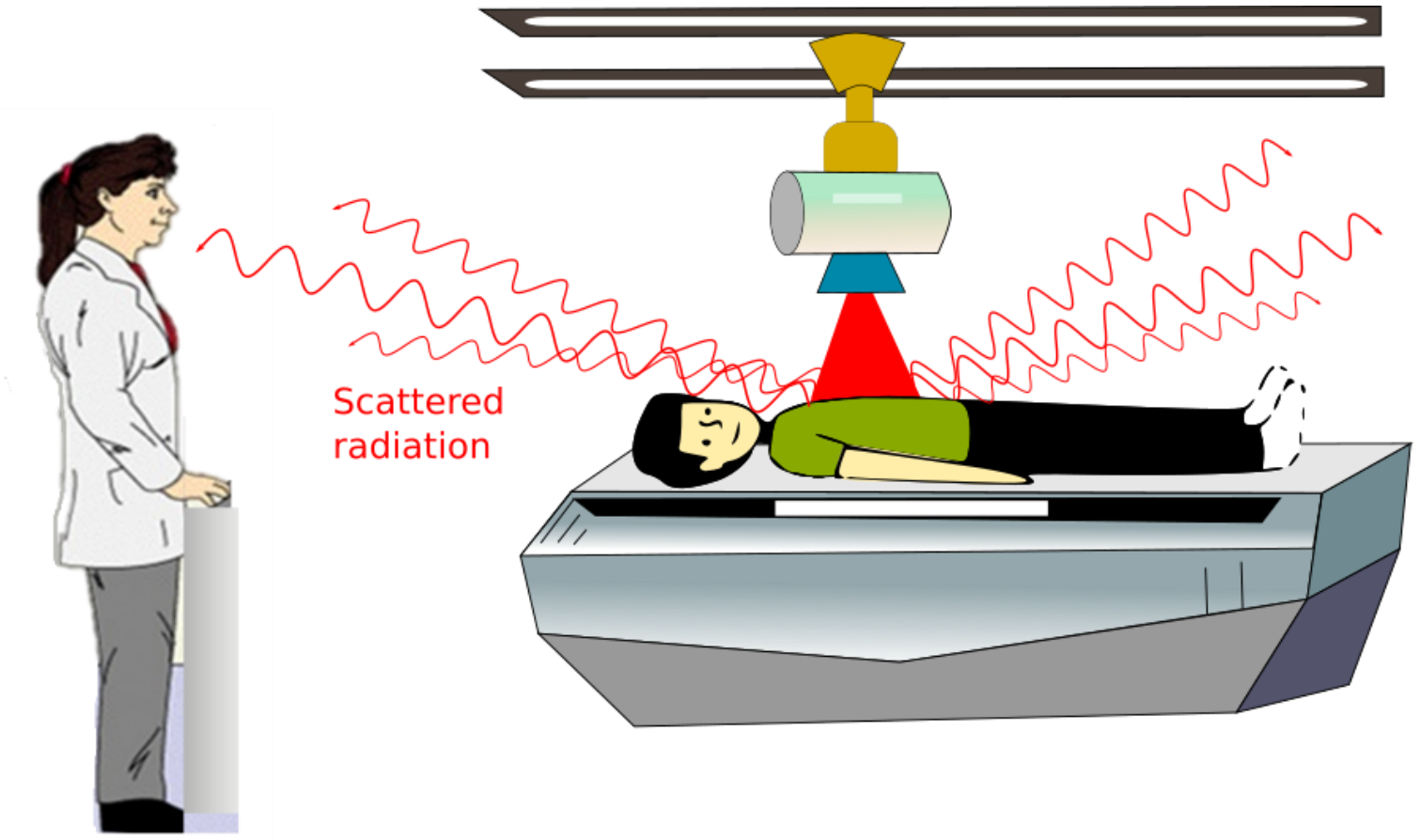
4. Injury in Rt. Gluteal region progresses to a non healing ulcer requiring skin graft

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.

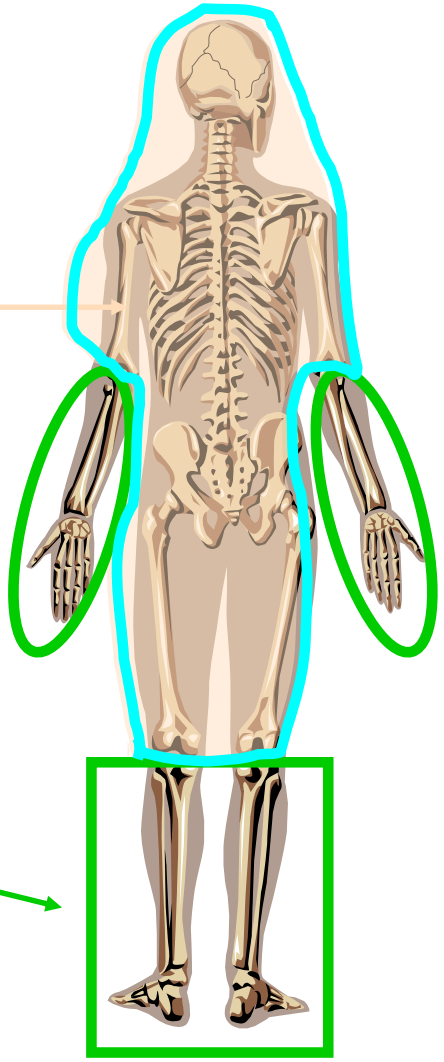
सत्यमेव जयते

- 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

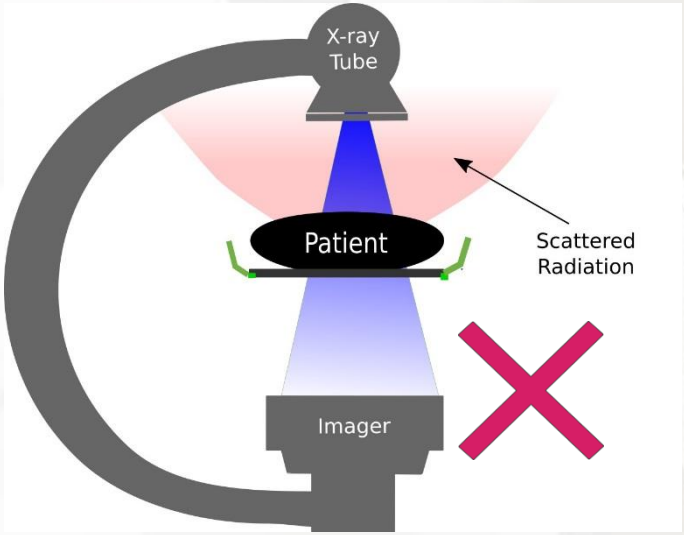
Extremities
500 mSv per year



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

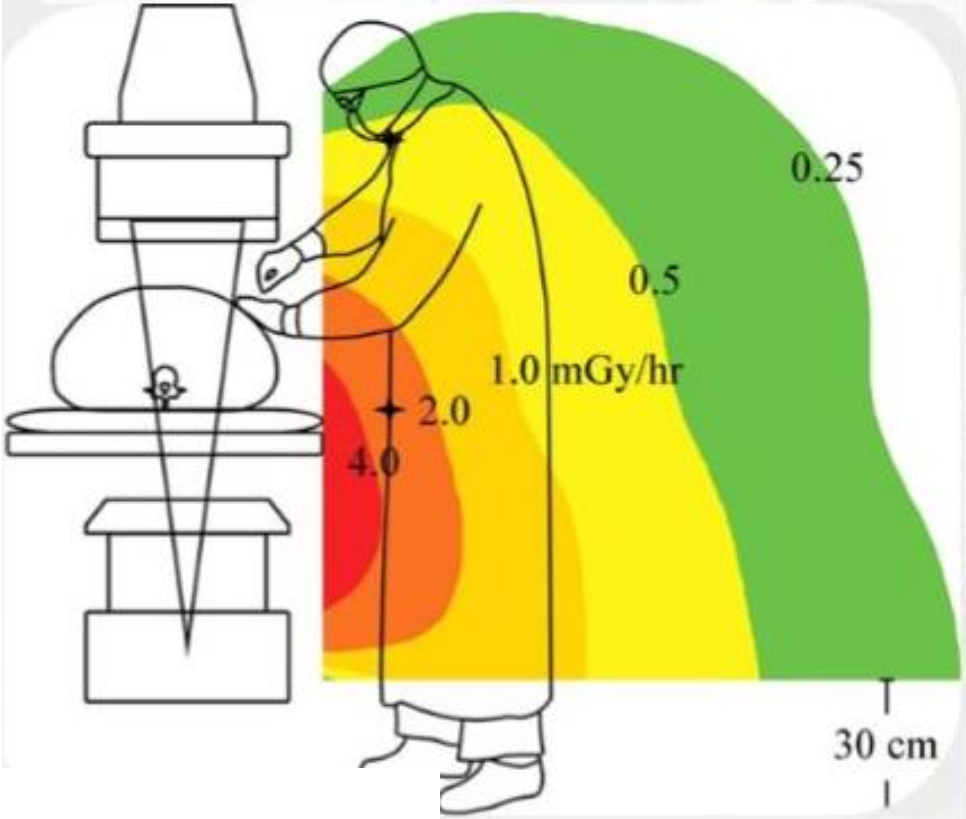
Distance—Dose to the hands

- 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

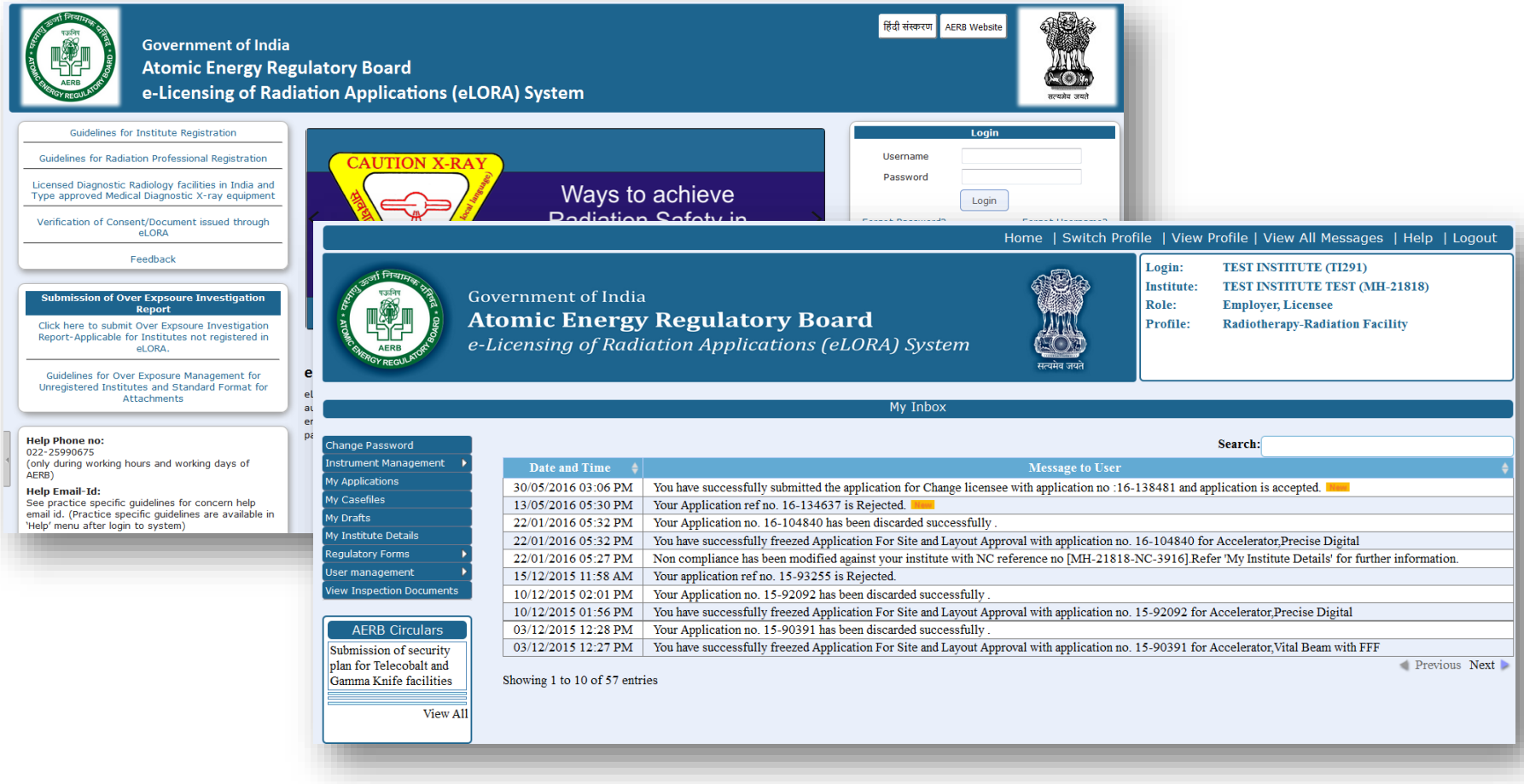
- In the past, reported many cases of exposures received above the stipulated limits of 30mSv that too in one quarter in Diagnostic Radiology practice.
- Typically 90% of these cases are non-genuine.
- Significant resources are expended by AERB for establishing the non-genuine/ genuine nature.
- AERB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



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