

## Radiation Protection Audit



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## Why Audit?

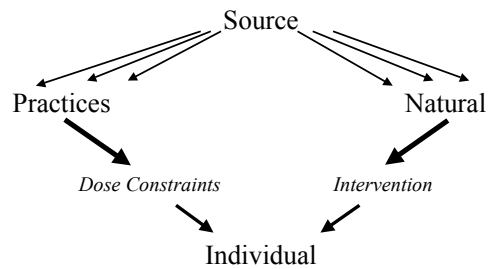
- Quality system (ISO 9000) requirement
- Best practice
- Legal compliance

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## ICRP Framework for Radiation Protection



## ICRP 60 Framework

For **PRACTICES** :

- **Justification**
- **Optimisation**  
– dose constraints
- **Limitation**



## ICRP 60 Framework

For **INTERVENTIONS**:

- **Justification**
- **Optimisation**

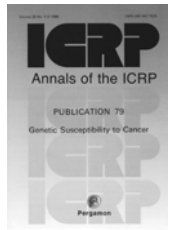


## Advisory Bodies



## ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

- Recommendations form basis of RP internationally
- Main commission and four standing committees
  - Effects, Doses, Protection in Medicine, Application of Recommendations
- Ad Hoc Task Groups and Working Parties
- *Annals of the ICRP*



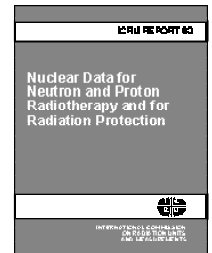
## International Commission on Non-Ionising Radiation Protection

- All non-ionising
- Established 1977 by ICRP
- Four standing committees
  - Epidemiology, Biology, Physics and Engineering, Optical Radiation
- Produce exposure guidelines, practical guides etc
- Publish in Health Physics & net



## ICRU International Commission on Radiation Units and Measurements, Inc.

- Measurements and Units
- Up to 20 report committees
- Publish own reports



## WHO/UNSCEAR

- Linked to United Nations
- One concern is Protection of the Human Environment
- Undertakes studies of environmental impact
  - Chernobyl
  - Depleted Uranium



## United Nations Scientific Committee on the Effects of Atomic Radiations

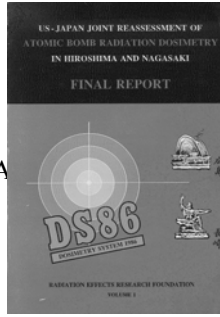
- UNSCEAR
- Established by UN General Assembly
- Assesses and reports on exposures to ionising radiation in general
- Latest report *UNSCEAR 2000*



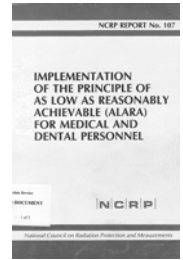
## Radiation Effects Research Foundation



- Formerly the Atomic Bomb Casualty Commission (ABCC)
- Laboratories in Hiroshima and Nagasaki
- Funded jointly by Japan and USA
- Epidemiological research
- Major publications on A-bomb dosimetry (T65D and DS86)



- US version of NRPB
- National meetings organised
- Publications include;
  - Reports, Commentaries, Reviews etc

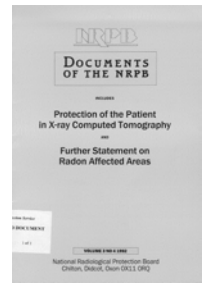


National Radiological Protection Board

- Established to
  - advance knowledge of radiation protection
  - provide information
- Publications
  - “At-a-glance”; Bulletin; Reports; Documents of the NRPB, Software
- Provides RP services



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## E-Mail Lists

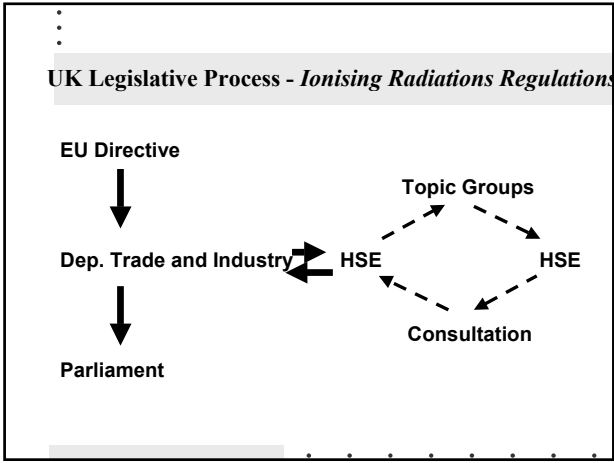
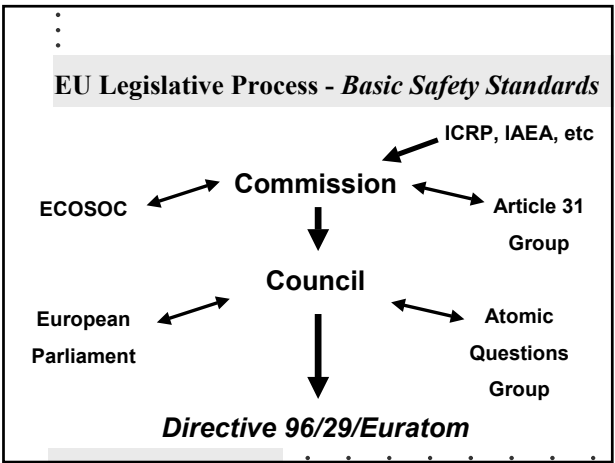
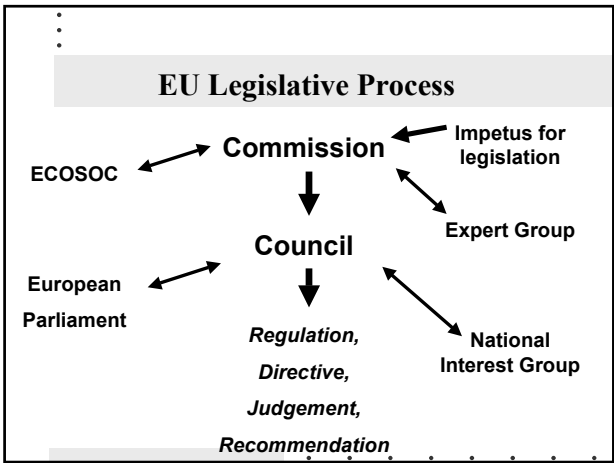
- (UK) Medical-Physics-Engineering
- (UK) Radiation Protection
- (US) MedPhys
- (US) Health Physics



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### IRR99

## Ionising Radiations Regulations 1999, Approved Code of Practice and Statutory Guidance

The image shows the cover of the **IRR99** document, titled "Work with ionising radiation". It features a collage of images related to radiation safety, including a person in a lab coat, a radiation source, and a control panel. The text on the cover includes "APPROVED CODE OF PRACTICE AND GUIDANCE" and "IRR".

### Governmental Bodies

This slide displays the logos of several governmental bodies: **HSE Health & Safety Executive**, **DETR Department of the Environment, Transport and the Regions**, **DH Department of Health**, and **MDA MEDICAL DEVICES AGENCY**. There is also a circular logo at the bottom right depicting a stylized human figure.

### Governmental Bodies

This slide displays the logos of **HSE Health & Safety Executive** and **DH Department of Health**, along with the same circular logo at the bottom right as seen in the previous slide.

## Compliance with Regulations

- Inspectorate
- Warrant cards
- Powers of enforcement
  - improvement notice
  - prohibition notice
  - prosecution



## The Audit Process

- Arrange time for visit
  - allow sufficient time
  - ensure all responsible persons available
- Follow systematic protocol (audit checklist)
- Provide written report
- Follow up on action points

## Audit checklist categories

- Follow up of previous recommendations
- General questions
- Records
- Modality-specific questions



## General questions

- Current workload
- Staff issues
- Follow up of visits from external agencies
- Awareness of latest information/documentation/regulation

## Records

### *General*

- Personnel monitoring
- Staff training

### *X-ray*

- QA
- Equipment maintenance
- PPE checks

### *Unsealed Sources*

- Contamination
- Storage and Waste disposal



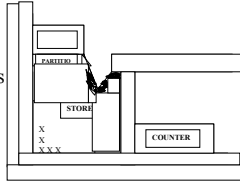
## Specific issues : X-ray examples

- Warning lights
- Warning signs
- Room shielding
- Film reject analysis
- Gonad protection



## Specific issues : Unsealed sources

- Adequacy of facilities
  - floor covering, sinks, drainpipes
- Storage of radioisotopes
- Accumulation/disposal of radioactive waste
- Availability of spill kit
- Contamination monitor(s) condition/calibration



Radioactive Material Radioactive Material Radioactive Material Radioactive Material

## Inspectors' Comments



BSS IRR99  
*Health and Safety Executive*

BSS RSA93  
*Environment Agency*

MED IR(ME)R2000  
*Department of Health*



## IRR99 (BSS)

- Poor Supervision and Training
- Inadequate Local Rules/SoW
  - some too long, some too short
- RPS not of sufficient standing
- Inadequate QA
- Poor understanding of radiation dose concepts
- Poor control of external engineers



## RSA93 (BSS)

- Records not up to date
- Records inaccurate
- Certificates not displayed
- Storage areas inadequate
- Facilities in disrepair



## IR(ME)R2000 (MED)

- Responsibilities not clarified
- Prescribers (Referrers) not properly identified
- Referral guidelines not available/not disseminated
- Poor procedures for
  - identification of patient
  - determining pregnancy



## Prescriber (Referrer) errors

- Referrer filled out paper request (same-day scan), followed by electronic request - sent by post - had a repeat CT head
- Referrer put incorrect 'addressograph' sticky label on request card
- 'XR' box ticked rather than 'CT' on card
- Request completed for patient in adjacent bed



## Patient ID errors

- Incorrect patient i/d sticker on request card
- Patient claimed *his* name was called out
- Father-son with same name, address, both as in-patients, one not wearing i/d bracelet
- English language difficulties (especially Asian patients)
- CXR given to wrong patient despite check of wrist-band by bank radiographer



## IR(ME)R incidents - year 1

- First year's total <100
- Of which:
  - 75% involve XR or CT
  - 50% involve patient i/d
  - 15% involve a language difficulty
  - 25% involve the incorrect exam on the right patient and 15% the correct exam on the wrong patient

## General X-ray

- Patient received unnecessary CXR, or unnecessary repeat XR (many examples)
- operator set mAs in the kV field
- 1 of 2 patients waiting had her exams 'swapped' - mammography and pelvic
- Patient for CXR had a Barium Enema (but did not get very far)

## Nuclear Medicine

- incorrect patient received a DMSA scan intended for an i/p in adjacent bed
- correct patient identified for the wrong scan - given bone instead of lung
- operator error reading ion chamber dose
- patient i/d error - correct name, correct address, same referrer, incorrect DoB

## Radiotherapy

- treatment plan stated to treat left SIJ but drawing and annotation for right
- patient prescribed 1Gy, given 10Gy, due to 'conversion error between Gy and cGy'
- geographical miss when portal imaging not functioning
- wedged field indicated on plan, but 'plain' written down rather than 'wedged'