

SENTINEL

- 22 Partners
- 17 member states
- 3 accession states



European Union



- Health care equates to 8.4% of GDP
- Radiology is 10% of revenue expenditure
- Radiology equipment is 15% of capital expenditure
- In the UK this equates to 15,000,000,000 euros

SENTINEL European Union



- Population 457,000,000
- 180,000,000 radiology examinations per year
- Population exposure 220,000 man Sv

SENTINEL



- 90% of all patient examinations
- 60% of collective dose
- 50% of man-made sources of radiation

SENTINEL European Union

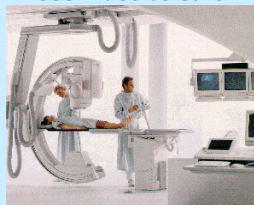


- Public concern about radiation in general
- Public want safe X-ray examinations
- Are all examinations justified

Technology Driven Revolution in Radiology

Introduction of new technology and imaging devices in radiology and nuclear medicine

These must be safe



Main Objectives

- Address efficacy and safety issues in all digital diagnostic examinations and nuclear medicine
- Particular emphasis on high dose procedures and sensitive groups



Objectives

- Establish physical and clinical image quality criteria and link the two
- Establish reference levels for new procedures, particularly for interventional radiology and cardiology



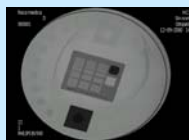
Objectives

- Develop good practice guidelines for new digital imaging equipment and procedures
- Develop training courses and supporting material



Functional Performance and Standards

- Investigate image quality indices and referral criteria
- Equipment performance surveys
- IEC/CEN/CENELEC



Efficacy and Safety Cardiology and Interventional Radiology

- Develop functional performance standards
- Patient dose surveys
- Optimisation studies
- Use of DICOM header for surveys and QA

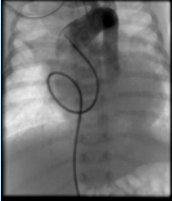


DICOM Header




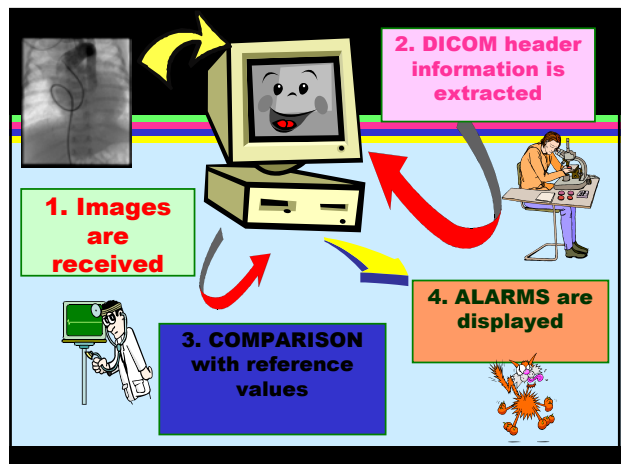
- DICOM header contains information on the procedure and dosimetry
- Accurate dosimetry requires extra calculations and calibration.
- Important differences between the different modalities and different X-ray systems.

DICOM HEADER
(contains useful information for QA, audit and patient dosimetry)




Siemens Axiom FD important DICOM tags

(0018,0040) : Cine Rate	: 30
(0018,0060) : KVP	: 97
(0018,1030) : Protocol Name	: Reg
(0018,1110) : Distance Source to Detector	: 947
(0018,1111) : Distance Source to Patient	: 798
(0018,1150) : Exposure Time	: 786
(0018,1151) : X-ray Tube Current	: 271
(0018,1154) : Average Pulse Width	: 6.5
(0018,115E) : Image Area Dose Product	: 1839
(0018,1162) : Intensifier Size	: 160
(0018,1190) : Focal Spot(s)	: 0.4
(0018,1510) : Positioner Primary Angle	: 0
(0018,1511) : Positioner Secondary Angle	: 0
(0018,1702) : Collimator Left Vertical Edge	: 0
(0018,1704) : Collimator Right Vertical Edge	: 1023
(0018,1706) : Collimator Upper Horizontal Ed	: 0
(0018,1708) : Collimator Lower Horizontal Ed	: 1023





What Parameters are audited




- Patient entrance dose (entrance air kerma).
- Dose area product (collimation).
- Radiographic technique (e.g. appropriate kVp).
- Appropriate use of the AEC.

What Parameters are audited



- Appropriate breast compression in mammography.
- Flat panel detector temperature.
- Number of series, number of images per series, kV, mA, ms and total number of images per procedure.
- Exposure index and postprocessing parameters (for CR).
- Repeated images (retakes).
- Image quality (basic evaluation).

A total of 3,506 paediatric patients have been selected for the dose evaluations



	0 <1 years sample size	1 < 5 years sample size	5 <10 years sample size	10 < 15 years sample size	TOTAL sample
Chest without bucky	1180	309	143	92	1724
Chest with bucky	0	181	255	363	799
Abdomen	93	30	69	150	342
Pelvis	254	128	122	137	641

Standardisation



- Direct Input to Industry both through Representation and as working participants in Standardisation Bodies
- Brings research results directly to bear on Equipment Design Process and Industry thinking

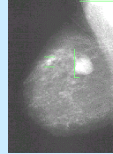
Formal Collaboration with IEC

- Acceptance Testing/Commissioning/QA
- Long term differences and lack of trust between industry engineers, end user physicists, et al.
- Criteria for Acceptability of Equipment in Europe under MED
- Major Achievement: Meeting (Oct 2007) between SENTINEL and IEC Industry representatives agreed to work approach and common issues



Efficacy and Safety in Mammography Screening

- Digital mammography
- Risk/benefit studies
- Tissue sampling techniques



Defining Aspects of Radiation Protection

- Relatively strong science base
- Developed mainly outside medicine, but is used mainly within medicine
- Employs arcane impenetrable language invented and protected by Physicists
- Inept in Social and Political Sciences (Note EU Medico Legal Survey)
- Global Industry and Local Health Care Provision

Ethics Issues in Radiology



- Identified a problem for Radiation Protection arising from a shift in dominant values in society since ICRP 26 and 60
- Ethicists will not solve the problems for us, but help us identify and formulate them
- Training essential to produce ethically sensitive and competent professions. Presently weak in this area.

Examples of Areas

- Right to Life
- Right to Bodily Integrity
- Individual Choice
- Consent
- Equality
- Equity
- Special Needs
- Ageism
- Trust of Authority
- Trust in Professions



Some Issues Identified

- Major Issues around Justification
- Philosophical assumptions underlying ICRP Recommendations need re-examining
- Pregnancy Issues
- Medico Legal Issues
- Population Screening Issues
- Issues around consent, authorisation, power of attorney, personal choice, self referral etc.
- Non Transparent Language for Discourse, particularly Quantities and Units

Pregnancy

- **Basis for Recommendations**
- **Diversity of Practice throughout Community**
- **Widespread high dose procedures need a more consistent approach**
- **Patient Consent?**

Non Medical Exposures

- **Exposures not primarily MEDICAL; Common Feature is lack of Medical Indication. Include:**
 - **Medico Legal,**
 - **Security,**
 - **Evidential**
 - **Commercial health screening,**
 - **Art**

Training Guidelines

- **Training needs identified**
- **Training syllabus developed**
- **Dissemination to member states via a series of training courses**



Summary



- **Safer, more effective procedures and examinations using new technology**
- **Greater public acceptance of medical uses of radiation**
- **Safer, more cost effective health care**

Radiology Can Be Decorative!

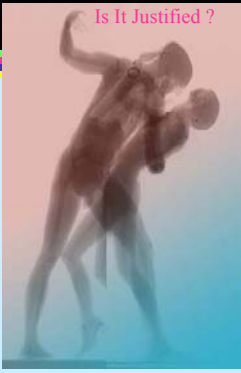


---- Or
Threatening

Is It Safe ?



Is It Justified ?



Is It Ethical ?