

IRSN

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Faire avancer la sûreté nucléaire

Session 8:

Radiation protection of patients and staff where procedures are performed outside radiology departments

Cécile ETARD, Med.Ph.

Medical Radiation protection Unit

Institut de Radioprotection et de Sûreté
nucléaire, FRANCE

Various areas concerned (1)

- Vascular surgery
- Gastroenterology
- Urology
- Gynaecology
- Orthopaedics
- Neurology
- Cardiology



C-Arm

→ **Operating room**



O-Arm



Digital detectors

Various areas concerned (2)

■ Bedside radiology

- Intensive Care Unit
- Neonatology



■ Dental radiology

- Intraoral
- Panoramic
- Conebeam CT

Various areas concerned (3)

→ A lot of different actors

- Surgeons
- Cardiologists
- Anaesthetists
- Dental surgeons
- Nurses
- Radiographers...

→ Various exposure levels

- Patients
- Staff

TABLE IV. DOSES RECEIVED BY OPERATORS

Event	Effective dose mSv	Doses to extremities mSv
No. 1 Nurse of operating theatre	21/quarter	
No. 2 Digestive radiologist		523/year
No. 3 Orthopaedic surgeon	27/year	
No. 4 Digestive radiologist	3.5/year	571 right hand/year 875 left hand/year
No. 5 Radiologist (intra-articular injections)		525/four months 677/four months

C. Rouse et al., 2012

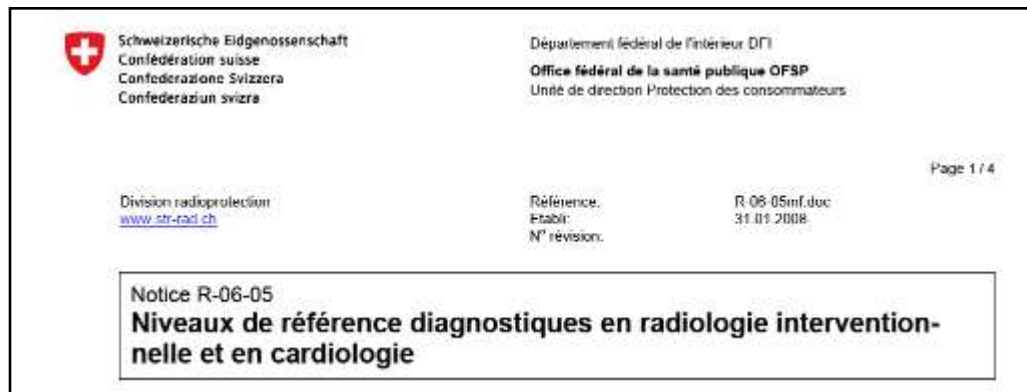
Very little data available

- Frequency of procedures
- Patient doses
- Staff doses

according to EMAN Project conclusions (2012)

www.eman-network.eu

- Few countries established DRL for these procedures



Important issues (1)

Radiation protection education and training of staff

- Very heterogeneous (sometimes none...)
- Basis for a good radiation protection of patients and staff...



- Patient-detector distance
- No protective screen

Medical physicist rarely involved

Important issues (2)

Equipment characteristics

- Adapted to the complexity of the procedures
 - Frame and pulse rates
 - Additional filtration
 - Field collimation...
 - Patient dose optimization
- Allowing KAP measurement
 - Patient dose monitoring
 - Alert system
- Adequate shielding for staff protection

Overexposure of a patient, after aneurysms embolization: long and complex intervention performed with an old equipment, without any add. filtration, nor KAP meter.



Important issues (3)

Staff dose monitoring improvement

- Personal dosimeters are not regularly worn in operating room,
- Some procedures require additional dose monitoring (fingers, eyes)
- Staff monitoring is not harmonized at international level,
 - Upon and/or above the apron
 - Passive and/or active dosimetry



- ➔ No protective screen
- ➔ No protective glasses
- ➔ Fingers in the x-ray field

Important issues (4)

Repeated procedures on children

- Sensitive population with a long life span

- Neonatology

- Repeated chest and abdominal radiographies during the first weeks of life
- Children who might have a medical follow-up for years, including x-ray procedures



- Dental radiology

- Intra-oral / Panoramic / Cone-beam CT
- In France : 50% of diagnostic procedures performed on children (5 to 15 years old) are dental examinations (2010)

Conclusion (1)

Radiation protection of patients and staff has improved in the medical field within the past decade, through :

- International recommendations (ICRP 85, AIEA TecDoc 1641...),
- IAEA training material and website,
- National regulations and inspections,
- Actions led by Professional Bodies,
- Daily work of radiation protection actors.

But “operating rooms” remain places where RP is not integrated in the routine practice

Conclusion (2)

Work has still to be done, in the future, to improve RP
“outside the radiology departments”

E & T of staff

- In France, training in RP is mandatory (every 10 years) for all professional using ionizing radiations for medical purpose
- An “irradiating” license ??

Equipments

- Commissioning / maintenance / QC / optimized protocols

Medical physicists involvement

Staff dose monitoring

- Eyes protection ?
- Hands monitoring ?
- Harmonization (type and number of dosimeters / estimation of E)

Thank you !