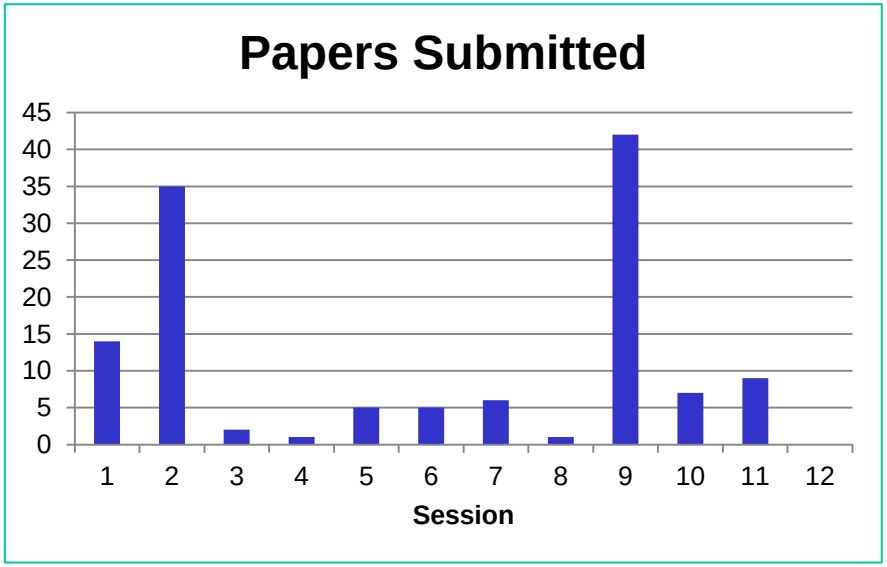
Session 9 - Occupational Radiation Protection in Medicine

Summary of Contributed Papers

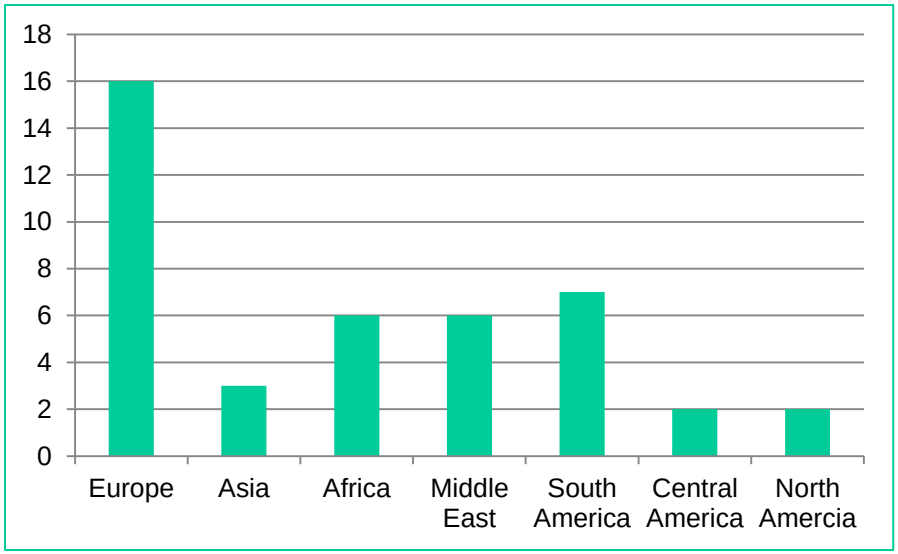
Stephen Fennell

Contributed Papers



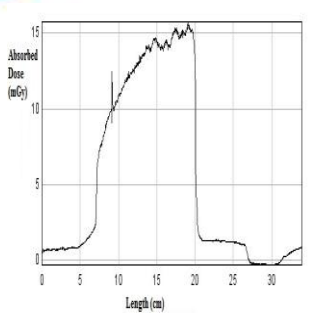
42 papers submitted

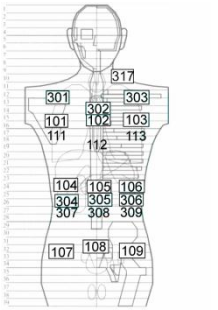
34 countries

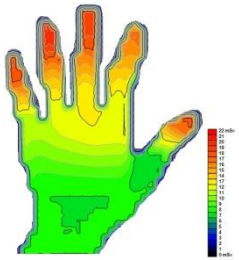


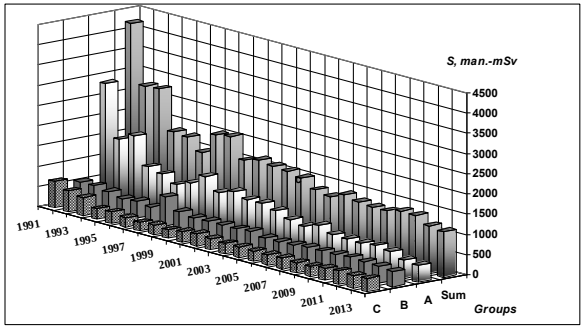
Topics Covered

- Eye Doses
- Interventional radiologists/cardiologists
- Radiotherapy
- PET/FDG
- Pregnant workers
- Nurses, maintenance workers, TSOs
- Shielding reviews
- Personal protective equipment
- Dental radiology
- Iodine ablation facility
- Occupational dosimetry surveys
- Dosimetry methodology





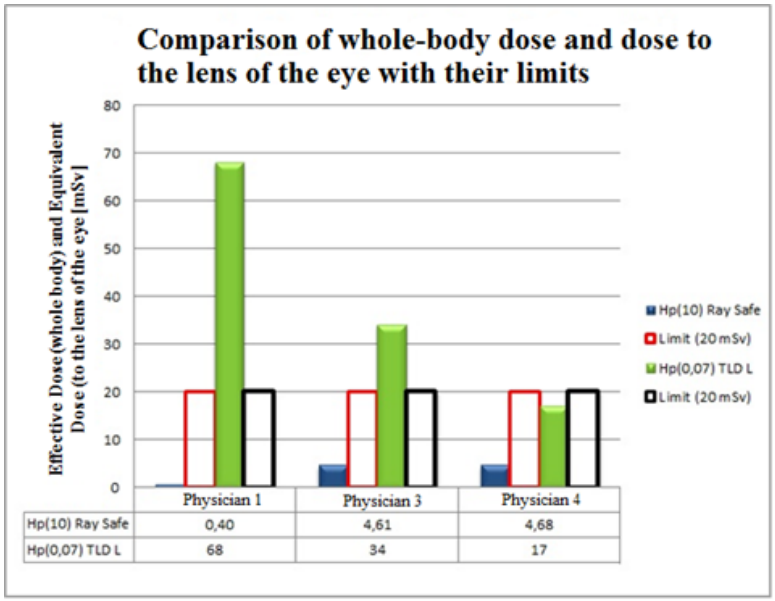




Pilot Study on Eye Lens Doses to Interventional cardiologists during CA/PTCA Procedures in Slovakia

D. Nikodemová, V. Trečková, D. Šalát

- 8 month study, 3 interventional cardiologists, 242 interventional procedures



- Highest eye dose on left side
- Eye dose limit can be exceeded while whole body dose < 5 mSv/yr
- Large variation in doses between staff for identical procedures (training)

Occupational Eye Doses from Diagnostic & Interventional procedures in an Irish Hospital setting. ***A review of findings from 2011 – 2014***

U. O'Connor, C. Walsh, A. Gallagher, A. Dowling, G. O'Reilly

- 3 year study, 30 staff, 1000 PET exams & 900 interventional procedures.
- Measurements made over eye glasses
  - Interventional Radiology/Cardiology
    - Left eye dose > right eye dose
    - Interventional: Left eye: Mean: 24.7 mSv/yr, Range; 7.1 – 44.9
    - Cardiology: Left eye: Mean: 12.5 mSv/yr, Range; 4.3 – 33.3
  - PET: doses relatively low (mSv/yr)
    - Mean 0.87 (left eye), Range: 0.04 – 2.01 (left eye)
  - Gastroenterologists (mSv/yr)
    - Mean: 11.7 (overcouch X-Ray, left eye)
    - Mean 1.3 (undercouch X-Ray, left eye)
  - Multiple employers – need to share dose data

Dose measurements to the lens in the team interventional radiological guidance assessment of the effectiveness of protective eyewear anti-X and accuracy of measurement in terms of Hp(3)

G.Sarti, F.Busca, L.Carpano, F del Dortore

- Protective efficiency of lead glasses

  Average attenuation is approximately 4 (range 3.3 – 5.2)

- Hp(0.07) recorded on whole body dosimeter (trunk) can provide a conservative indicator of dose to the lens
  - Corrective factor where eyewear worn

Eye dosimetry assessment for interventional radiology and cardiology staff
Tuohy B, Lavin D, Taafe S, Van Der Putten W

- 6 week study, 7 staff
  - Poor compliance with wearing of lead glasses
  - Cardiology & radiology nurses have potential to exceed 20 mSv/yr

Staff Member	Number of procedures performed	Fluoroscopy time (mins)	DAP ($Gycm^2$)	Eye Dose (µSv)	Eye dose per procedure (µSv)	Eye dose per year (mSv)
Cardiologist A	23	224.5	2041.6	410	17.8	13.7
Cardiologist B	27	202.9	1985.9	20	0.74	4.6
Cardiology Nurse	16	105.7	1043.8	210	13	41.6*
Interventional Radiologist A	14	50.6	347.6	120	8.6	1.0
Interventional Radiologist B	12	40.1	274.6	380	31.7	3.3
Interventional Radiologist C	16	38	876.3	90	5.6	0.8
Radiology Nurse	23	81.5	401.9	110	4.8	10.4*

Reducing Doses

- *Simo et al*
  - Increased regulatory presence and commencement of national dose monitoring programme in Cameroon in 2011. Significant reduction in medical occupational doses

Year	Number of Facilities Registered	Number of Workers Monitored	Average Annual Cumulated Whole Body Dose (mSv)
2011	05	64	1.0
2012	11	117	0.5
2013	22	203	0.4
2014	25	250	0.3

- *Hudzietzová et al*
  - Semi-automatic dispensing feeders can result in substantial reduction in occupational doses.

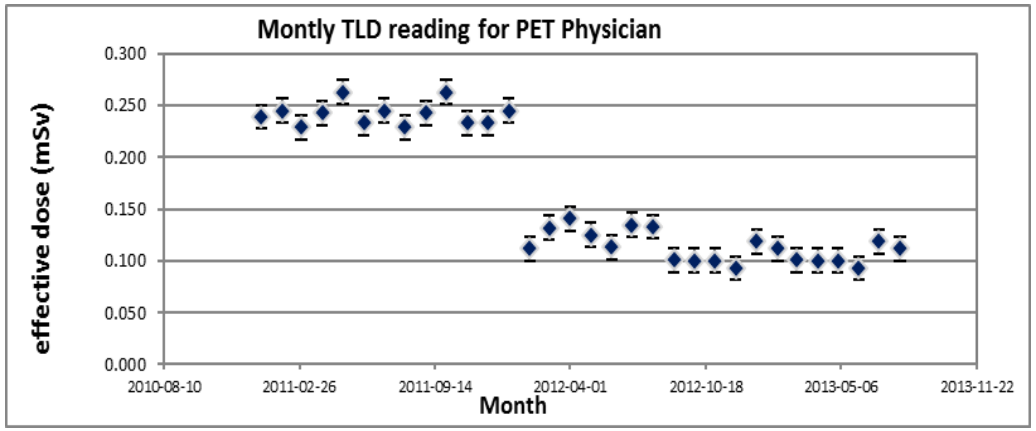
Reducing Doses

- *Alves et al*
  - Needle holders in CTF procedures can result in a 10-fold reduction in hand doses

Integrated $H_P(0.07)$ to the tip and base of each finger with needle holder (this work) and without [12]				
	Tip		Base	
Finger	With (this work)	Without [12]	With (this work)	Without [12]
Thumb	17,3	118	7,8	26
Index	16,7	186	12,6	89
Middle	18,7	179	13,3	101
Ring	19,4	216	12,2	87
Little	18,0	133	11,2	71

Reducing Doses

- *Abughaith et al*
  - Auto injectors for FDG administrations can reduce whole body effective dose by 40%



- *Al-Haj et al*:
  - Auto injectors decreases staff doses by a factor of 4
  - Training provided a dose reduction of a factor of 10

Challenges in Occupational Radiation Protection at Advanced Radiotherapy Facilities in Pakistan

Nusrat I, Warsi, Mishkat A. Jafri, Zahid Rashid

- Recent advances in Radiotherapy in Pakistan
  - Stereotactic radio-surgery, high energy radiotherapy, IMRT, Cyberknife, IGRT
  - New private facilities
- New challenges
  - neutron dosimetry, unavailability of TSOs, lack of formally qualified workforce, non-availability of formal professional bodies, emergency preparedness
- How PNRA is managing the challenges associated with:
  - Education & training
  - Provision of expert advice
  - Shielding calculations
  - Area surveys, incl. neutron monitoring
  - Personal dosimetry

Common themes (I)

- Evidence of reducing doses in many papers
  - However, high doses still occurring (up to 50 mSv/yr)
  - Training mentioned in 24/42 and Education in 12/41 papers
    - Interventional radiologists/cardiologists, nurses, maintenance workers, TSOs
  - Radiation protection needs to be included in refresher training

- Eye doses
  - Not an issue for PET/nuclear medicine
  - Concerns for interventional workers
  - Lead glasses and shielding devices work – but they must be used!
  - Dose data needs to be shared among employers

Common themes (II)

- Reducing doses can be simple
  - Automatic injectors, syringe shields, reviewing shielding, lead-free protection sheets, training & refresher training
  - Must be used properly and backed up by education & training
- Regulatory bodies have an important role in radiation protection
- Advances in equipment and procedures are leading to new challenges for ORP