

## International Resources and Programs for Medical Physicists for Training in Radiation Protection

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## Learning Objectives

1. To learn about educational resources and training programs in the area of radiation protection of patients and medical radiation protection
2. To understand how medical physicist can interact more efficiently with clinical colleagues using radiation protection as a tool.

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## Changing scenario in Radiation Protection

- Prior to 2000: Occupational Radiation Protection (ORP) dominated the field of radiation protection
- Significant improvements in ORP, doses are minimal typically 0-3 mSv/yr
- Recent issue cataract among interventionalists
- Current century: Focus on Radiation Protection of Patient (RPOP)

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**Changing scenario**  
**Previously: You have to work whole life with radiation, whereas the patient may undergo procedure only few times**



**Now**

Cumulative life time dose  
patient>>> staff life time dose

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## International Resources from

- IAEA
- ICRP
- European Commission (EC)
- WHO, UNSCEAR
- Some professional societies:  
IOMP/IRPA/EFOMP

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## National resources (outside the scope of this talk)

- NCRP
- Image Gently
- Image Wisely
- RSNA
- AAPM

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## Resources

### FREE download

- Power point slides
- Publications
- Webinars
- eLearning material
- Presentations

### Not FREE

- Publications

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## Programs

- IAEA Training Programs: For participants from developing countries. Trainers from developed countries.
- IOMP supported training activities

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**Website** <http://rpop.iaea.org>

IAEA | Radiation Protection of Patients (RPOP)

Search RPOP:

Home | Information for: | Additional Resources | Special Groups | Member Area | About Us | Our Work | IAEA.org

**Be Informed About the Safe Use of Ionizing Radiation in Medicine**  
Information to help health professionals achieve safer use of radiation in medicine for the benefit of patients

Information for: Health Professionals, Member States, Patients, Public

Additional Resources: Publications, International Standards, Training

Special Groups: Pregnant Women, Children, RPOP Newsletter

Member Area: Member States Area, Drafts Management Area

**Latest Literature**  
Fernandes, M.B., Bagnardi, A., Pierre, S.A., Scialo, C.D. Jr., Rømpersaard, E., Pearce, M.S., Preminger, G.M., Radiation exposure in the acute and short-term management of ambulances at 2 academic centers, J. Unit. MR 2 Feb. 2009; 666-672.  
Keeley, F.A., Jr., Thornton, M., Radiation safety: implications for urologists and patients, J. Unit. MR 2 Feb. 2009; 643-644.  
Vano, E., Ubeda, C., Leyton, F., Miranda, P., Gonzalez, L., Staff Radiation Doses in Interventional Cardiology: Correlation With Patient Exposure, Pediatr. Cardiol. (Lan. Yoon).

**Did You Know That...**  
3: It is safe to have an X-ray provided the examination is carefully justified and radiation protection principles are observed.

**Latest News**  
New Publications on Better Imaging Techniques released  
Downloaded FREE three new publications on radiation protection in newer imaging techniques (PET/CT, Cardiac CT and CT colonography).  
Cardiologists' Newsletter  
Next issue of the Newsletter of the Asian Network of Cardiologists in Radiation Protection is now available.

**Upcoming Events**  
Meeting planned to prepare contents for patient information part of this website, Vienna, 4-5 May 2009  
Meeting to discuss framework for patient information, draw guidelines and prepare contents  
Meeting for Smart Card for long term record of patient doses, Vienna, 27-29 April 2009  
The first meeting on this project will be held in IAEA Vienna.

**20 million hits/y, ~0.4 million visits/y, 190 countries**

## How to reach RPOP website

- Google search: Direct on various pages
- *radiation protection in.....pregnancy, ...mammography, ...fluoroscopy, ...CT, ...radiology, ...nuclear medicine, ..radiotherapy, ...cardiology, ...children, ...dental radiology, ...DEXA, ...PET/CT, ...interventional radiology, ...fluoroscopy, ...gastroenterology, ...urology, ...orthopedic surgery...*
- Trough [iaea.org](http://iaea.org): Long [Navigation vs search]

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## Translation

Nuclear

English Español

IAEA | Radiation Protection of Patients (RPOP)

Search RPOP:

Home | Information for: | Additional Resources | Special Groups | Member Area | About Us | Our Work | IAEA.org

**Be Informed About the Safe Use of Ionizing Radiation in Medicine**  
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Information for: Health Professionals, Member States, Patients and Public

Additional Resources: Publications, International Standards, Training | Poster | Movie

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Keeley, F.A., Jr., Thornton, M., Radiation safety: implications for urologists and patients, J. Unit. MR 2 Feb. 2009; 643-644.  
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| Country / Territory | Sessions | % Sessions |
|---------------------|----------|------------|
| 1.  United States   | 126,044  | 26.17%     |
| 2.  Spain           | 33,885   | 7.04%      |
| 3.  Mexico          | 32,147   | 6.67%      |
| 4.  United Kingdom  | 31,934   | 6.63%      |
| 5.  Colombia        | 18,541   | 3.85%      |
| 6.  India           | 18,266   | 3.79%      |
| 7.  Argentina       | 14,854   | 3.08%      |
| 8.  Canada          | 14,781   | 3.07%      |
| 9.  Australia       | 13,970   | 2.90%      |
| 10.  Chile          | 11,960   | 2.48%      |

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Home > Training

**Free Material** **As power point slides**



- Diagnostic and Interventional Radiology** →
- Radiotherapy** →
- Nuclear Medicine** →
- Prevention of Accidental Exposure in Radiotherapy** →
- Cardiology** →
- PET/CT** →
- Paediatric Radiology** →
- Digital Radiology** →
- Doctors using fluoroscopy outside radiology (Urologists, Gastroenterologists, Orthopaedic surgeons etc.)** →

**Русский**

**About 40,000 downloads/yr**

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**RPOP**

**Lectures/Slides**

All 23 modules (ZIP of 28 files, 89.29 Mb)

- 00. Principles of Radiation Protection and Motivation for the Course (10,548 KB)
- 01. Overview of radiation protection in diagnostic radiology (1,147 KB)
- 02. Radiation units and dose quantities (2,193 KB)
- 03. Biological effects (7,386 KB)
- 04. International system of radiation protection (871 KB)
- 05. Interaction of radiation with matter (10,586 KB)
- 06. X-ray production (6,517 KB)
- 07. X-ray beam (1,877 KB)
- 08. Factors affecting image quality (16,119 KB)
- 09. Medical exposure BSS (1,739 KB)
- 10. Patient dose assessment (1,050 KB)
- 11. Quality assurance (673 KB)
- 12. Shielding and X-ray facility design (1,047 KB)
- 13. Occupational exposure: Part 1 (1,240 KB)
- 13. Occupational exposure: Part 2 (5,493 KB)
- 14. Radiation exposure in pregnancy (1,101 KB)
- 15. Optimization of protection in radiography: Part 1 (12,399 KB)
- 15. Optimization of protection in radiography: Part 2 (1,207 KB)
- 16. Optimization of protection in fluoroscopy: Part 1 (5,554 KB)
- 16. Optimization of protection in fluoroscopy: Part 2 (1,480 KB)
- 17. Optimization of protection in interventional radiology: Part 1 (1,045 KB)
- 17. Optimization of protection in interventional radiology: Part 2 (1,480 KB)
- 18. Optimization of protection in CT (3,460 KB)
- 19. Optimization of protection in mammography (880 KB)
- 20. Optimization of protection in digital radiology (3,045 KB)
- 21. Optimization of protection in paediatrics (6,113 KB)
- 22. Optimization of protection in dental radiology (5,086 KB)
- 23. Organizing a QA program in diagnostic radiology (1,170 KB)

**Practicals**

All exercises (ZIP of 28 files, 59.2 Mb)

RPOP on Twitter

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- 23. Organizing a QA program in diagnostic radiology (1,170 KB)

**Practicals**

All exercises (ZIP of 28 files, 59.2 Mb)

- 12. Shielding and X-ray facility design: Part 1 (1,196 KB)
- 12. Shielding and X-ray facility design: Part 2 (8,126 KB)
- 13. Optimization of protection in radiography: Part 1 (4,102 KB)
- 13. Optimization of protection in radiography: Part 2 (492 KB)
- 15. Optimization of protection in radiography: Part 3 (1,057 KB)
- 15. Optimization of protection in radiography: Part 4 (486 KB)
- 15. Optimization of protection in radiography: Part 5 (520 KB)
- 15. Optimization of protection in radiography: Part 6 (984 KB)
- 15. Optimization of protection in radiography: Part 7 (3,862 KB)
- 15. Optimization of protection in radiography: Part 8 (499 KB)
- 15. Optimization of protection in radiography: Part 9 (511 KB)
- 16. Optimization of protection in fluoroscopy: Part 1 (9,843 KB)
- 16. Optimization of protection in fluoroscopy: Part 2 (8,186 KB)
- 16. Optimization of protection in fluoroscopy: Part 3 (8,113 KB)
- 16. Optimization of protection in fluoroscopy: Part 4 (3,167 KB)
- 16. Optimization of protection in fluoroscopy: Part 5 (788 KB)
- 16. Optimization of protection in fluoroscopy: Part 6 (1,334 KB)
- 18. Optimization of protection in CT (2,121 KB)
- 19. Optimization of protection in mammography: Part 1 (515 KB)
- 19. Optimization of protection in mammography: Part 2 (1,327 KB)
- 19. Optimization of protection in mammography: Part 3 (731 KB)
- 19. Optimization of protection in mammography: Part 4 (568 KB)
- 19. Optimization of protection in mammography: Part 5 (528 KB)
- 19. Optimization of protection in mammography: Part 6 (1,610 KB)
- 19. Optimization of protection in mammography: Part 7 (6,196 KB)
- 19. Optimization of protection in mammography: Part 8 (1,367 KB)
- 19. Optimization of protection in mammography: Part 9 (510 KB)
- 19. Optimization of protection in mammography: Part 10 (518 KB)

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**Power Point Slides (not pdf)**

**IAEA Radiation Protection of Patients (RPOP)**

Home Information for Additional Resources Special Groups Member Area

Information for Health Professionals Member States Patients

Home > Training > Free Material

**Paediatric Radiology**

Training material developed in collaboration with Image Gently

**Lectures/Slides**

All 10 modules (ZIP of 10 files, 40.92 Mb)

- 01. Why Talk About Radiation Protection during Radiological Procedures in Children (4,290 KB)
- 02. Understanding Radiation Units (5,544 KB)
- 03. Radiation Protection of Children in Screen Film Radiography (8,748 KB)
- 04. Radiation Protection of Children in Digital Radiography (2,951 KB)
- 05. Radiation Protection of Children in Fluoroscopy (2,537 KB)
- 06. Radiation Protection of Children During Computed Tomography (6,597 KB)
- 07. Radiation Protection of Children in Interventional Radiology and Cardiology (3,003 KB)
- 08. Standards and Guidelines in Radiological Procedures in Children (6,304 KB)
- 09. Quality Assurance in Paediatric Radiological Procedures (1,497 KB)
- 10. Organization of a Paediatric Radiology Department (6,194 KB)

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**Diagnostic and Interventional Radiology**

Training material developed in collaboration with

- World Health Organization (WHO)
- Pan American Health Organization (PAHO)
- International Labour Organization (ILO)
- International Society of Radiology (ISR)
- International Organization for Medical Physics (IOMP)
- International Society of Radiographers and Radiological Technologists (ISRTT)

**Русский**

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field of patient protection.

Please see below the list of available courses:

If you wish to receive a certificate:

1. Register with NUCLEUS
2. Confirm the email link received after your registration
3. Once your IAEA Nucleus account is activated, click on <http://elearning.iaea.org/m2/course/index.php?categoryid=75> and select one of the courses
4. Enroll yourself in the course
5. After viewing the material, take the course quiz/quizzes. If you answer correctly at least 80%, you can obtain a certificate of completion.

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webinars RPOP

About 3,600 results (0.95 seconds)

**Free Webinars - Radiation Protection of Patients - International Atomic ...**  
<https://rop.iaea.org/RPOP/RPoP/Content/AdditionalResources/...webinars/index.htm>  
 Participate in our free webinars on hot topics from the radiation protection in medical uses of ionizing radiation, and take the opportunity to learn from the world's ...  
 You've visited this page 4 times. Last visit: 9/10/16

**IAEA webinars on topics from radiation protection in ... - IAEA RPOP**  
<https://rop.iaea.org/RPOP/RPoP/Content/News/2-IAEA-webinars.htm>  
 The Radiation Protection of Patients Unit of the IAEA has started a new initiative: free webinars on topics in radiation protection in medical uses of ionizing ...

**Upcoming webinar jointly with LatinSafe: How to ... - IAEA RPOP**  
<https://rop.iaea.org/RPOP/RPoP/...webinars/...webinar/index.htm>  
 Upcoming webinar jointly with LatinSafe: How to implement a CT dose optimization program (in Spanish) (29 June 2017, 4 pm CET) ...

**Radiation Protection of Patients**  
<https://rop.iaea.org/>  
 RPOP celebrates sending the 100th update to its subscribers ... Smart Card project, Bonn Call for Action, RPOP Free Webinars, Safety in Radiation Oncology.

**Free Series of Joint Webinars on Imaging for Children: Using the ...**  
<https://rop.iaea.org/RPOP/RPoP/Content/News/2017-2-free-webinars.htm>  
 The Radiation Protection of Patients Unit of the IAEA is continuing in its successful initiative: free

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|  |   |                            |  |
|--|---|----------------------------|--|
| Image Gently: Radiation exposure in children with congenital and acquired heart disease: An overview of risks and strategies for multi-modality optimization | Prof. Kevin Hill  | 9 May 2017, 3 pm CET       | Recording                                |
| Image Gently: Progress and challenges in CT education and advocacy   | Prof. Kimberly E. Applegate, Mr. Dean Pekarovic, Ms. Hanna Muller and Ms. Caren Swenson | 4 April 2017, 3 pm CET     | Recorded broadcast                       |
| Image Gently: Optimization of radiography in children – the case of chest radiographs  | Prof. Kimberly E. Applegate (Panelist), Ms. Beatrix Kotz (Panelist)                     | 23 February 2017, 3 pm CET | Recorded broadcast                       |
| Strategies for Communicating Radiation Risk for Medical Imaging in Children  | Prof. Donald Frush  | 15 December 2016, 3 pm CET | Recorded broadcast                       |
| Radiation exposure of the pregnant and breastfeeding patients in nuclear medicine  | Assoc. Prof. Sigrid Leide-Svegborn  | 13 October 2016, 2 pm CET  | Recorded broadcast                       |
| Managing X-ray exposure to pregnant patients   | Prof. John Damiakis   | 14 July 2016, 2 pm CET     | Recorded broadcast                       |
| Approaches to estimating radiation exposure to the lens of the eye during interventional procedures (SPANSIS)  | Prof. Eliseo Vano   | 4 May 2016, 3 pm CET       | Recorded broadcast                       |
| Radiation induced skin injuries in interventional procedures   | Dr. Madan Rehani  | 5 April 2016, 3 pm CET     | Recorded broadcast                       |
| Approaches to estimating radiation exposure to the lens of the eye during interventional procedures  | Prof. Eliseo Vano   | 9 March 2016, 3 pm CET     | Recorded broadcast<br>List of references |
| Is cataract a real risk to those working in interventional suites?   | Dr. Madan Rehani  | 4 February 2016, 3 pm CET  | Recorded broadcast                       |

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## FAQs and Posters

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IAEA Radiation Protection of Patients (RPOP)

Home » Health Professionals » Other Specialties & In... » Radiation and cataract

### Radiation and cataract : Staff protection

What is RPD?

- 1. Which part of the eye does cataract affect?
- 2. Is cataract caused by ionizing radiation different from that caused by age?
- 3. Is it possible to diagnose radiation-induced eye lens injuries?
- 4. Is there a unique system of classification of radiation induced opacities?
- 5. How to treat cataract?
- 6. How much radiation dose to the eye lens is necessary for the production of radiation injuries?
- 7. How soon after a radiation exposure can one expect to see radiation-induced eye lens injuries?
- 8. Is there a specific dose limit for eyes?
- 9. Which health professionals are at risk of radiation induced eye lens injury?
- 10. Which factors can affect eye lens dose in fluoroscopy procedures?
- 11. How can I manage eye lens exposure and prevent eye lens injuries?
- 12. How efficient are personal protection tools?
- 13. Is there a risk of cataract after several years of work in a catheterization laboratory?
- 14. What are the typical eye lens doses associated with diagnostic and therapeutic interventional procedures?
- 15. How can eye lens dose be measured more effectively?
- 16. Is there a correlation between staff eye lens doses and patient dose?

1. Which part of the eye does cataract affect?

There are three predominant forms of cataract depending on their anatomical location (Fig.1) in the eye lens: cortical, nuclear and posterior sub-capsular (PSC). As a person ages, any one type, or a combination of any of these three types, can develop over time. The most common form of age-related cataract caused normally by

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IAEA Radiation Protection of Patients (RPOP)

Home » Health Professionals » Other Specialties & In... » Radiation and cataract

### Radiation and cataract : Patient protection

What is RPD?

- 1. Which X ray procedures and clinical conditions are associated with elevated eye lens doses to the patient?
- 2. What are typical eye lens doses to patients associated with diagnostic and interventional procedures?
- 3. How can I manage eye lens dose and prevent injuries in patients?

1. Which X ray procedures and clinical conditions are associated with elevated eye lens doses to the patient?

In procedures such as head CT, paranasal sinus CT, temporal bone and orbital CT and neuro-interventional procedures, the eye is most likely in the field of the primary X-ray beam and thus will have the potential to receive a higher dose if appropriate techniques to optimize protection of the eye are not used. Table 2 lists radiation dose to the eye in different examinations and procedures. As is apparent, when the eye is not in the primary beam (for examinations of body areas excluding the head), the scattered radiation dose is very small.

Patients with recurrent and chronic conditions are among those who require frequent examination. As an example, 26% of patients with hydrocephalus receive radiation dose to lenses higher than 150 mSv within 3 years [37]. In paediatric patients, repeated head CT examinations result in average cumulative dose to lens of the eye of 26 mSv over a few years, but it can be as high as 1.3 Gy [38].

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2. What are typical eye lens doses to patients associated with diagnostic and interventional procedures?

Typical values in terms of absorbed dose to the patient's lens of the eye per procedure are presented in Table 2 below.

Table 1. Typical eye lens doses to patients' eyes for various X-ray procedures in children and adults\*

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10 Pearls: Radiation protection of *patients* in fluoroscopy

<http://rpop.iaea.org>

Translation into many languages

10 Pearls: Radiation protection of *patients* in fluoroscopy

1. Maximize distance between the X-ray tube and the patient to the extent possible.
2. Minimize distance between the patient and the image receptor.
3. Minimize fluoroscopy time.
4. Use pulsed fluoroscopy with the lowest frame rate possible to obtain images of acceptable quality.
5. Avoid exposing the same area of the skin in different projections.
6. Larger patients or thicker body parts trigger an increase in entrance surface dose (ESD).
7. Oblique projections also increase ESD.
8. Avoid the use of magnification.
9. Minimize number of frames and one-time to clinically acceptable level.
10. Use collimation.

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10 Pearls: Radiation protection of *patients* in fluoroscopy

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10 Pearls: Radiation protection of *staff* in fluoroscopy

1. Use protective devices!
2. Make good use of time-distance-shielding (TDS) principle.
3. Use ceiling suspended screens, lateral shields and table curtains.
4. Keep hands outside the primary beam unless totally unavoidable.
5. Only 1-5% of radiation falling on the patient's body exits the other side.
6. Keep X-ray tube under the patient table and not over it.
7. Use personal dosimetry.
8. Update your knowledge about radiation protection.
9. Address your concerns about radiation protection to radiation protection specialists (medical physicists).

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10 Pearls: Radiation protection for *children* in interventional procedures

1. Remember: Some tissues of a growing child are more sensitive to radiation than adult.
2. Discuss with parents before the procedure.
3. Increase awareness among your team members through the use of a pre-procedure safety checklist.
4. Plan the procedures in detail and in advance to avoid improper or aborted runs or other repeated exposures.
5. Protect the patient's thyroid, breast, eyes and gonads where possible.
6. Use optimal technique.
7. Use "last image hold" rather than additional exposures, where appropriate.
8. Increase distance between patient and the X-ray tube and decrease distance between patient and image receptor.
9. Use dose recording and dose reduction technologies in equipment.
10. Review and record radiation dose after the procedure.

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| Language              | Patient   | Staff   |
|-----------------------|---|---|
|                       |  |    |
| English               | 10 pearls on radiation protection of patients in fluoroscopy<br>Download PDF      | 10 pearls on radiation protection of staff in fluoroscopy<br>Download PDF           |
| عربي (Arabic)         | التي عشرة: الوقاية الإشعاعية للمرضى من التصوير الإشعاعي<br>Download PDF           | التي عشرة: الوقاية الإشعاعية لطاقم التصوير الإشعاعي<br>Download PDF                 |
| Български (Bulgarian) | 10 златни правила: Радиационна защита на пациентите при скопия<br>Download PDF    | 10 златни правила: Радиационна защита на персонала при скопия<br>Download PDF       |
| 中文 (Chinese)          | 十大要訣：X射线透视中患者的放射防护<br>Download PDF  | 十大要訣：X射线透视中职业人员的放射防护<br>Download PDF  |
| Hrvatski (Croatian)   | 10 Zlatnih Pravila—Zaštita bolesnika od zračenja u dijaskopiji<br>Download PDF    | 10 Bisera: Zaštita osoba od zračenja pri dijaskopiji<br>Download PDF                |
| Deutsch (German)      | 10 Tipps: Strahlenschutz für Patienten bei Durchleuchtung<br>Download PDF         | 10 Tipps: Strahlenschutz des Personals i.d. Durchleuchtung<br>Download PDF          |
| Ελληνικά (Greek)      | 10 χρυσά κανόνες: Ακτινοπροστασία ασθενών κατά την ακτινοσκόπηση<br>Download PDF  | 10 χρυσά κανόνες: Ακτινοπροστασία προσωπικού κατά την ακτινοσκόπηση<br>Download PDF |
| Français (French)     | 10 Recommendations: Radioprotection des patients en fluoroscopie<br>Download PDF  | 10 Recommendations: Radioprotection du personnel en fluoroscopie<br>Download PDF    |

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|                         |  |  |
|-------------------------|--|--|
| עברית (Hebrew)          | 10 כדורים להגנה מפני קרינה חשמית במהלך פליקס<br>Download PDF                             | 10 כדורים להגנה מפני קרינה חשמית במהלך פליקס<br>Download PDF                                   |
| Indonesia (Indonesian)  | 10 Mutiara: Proteksi Radiasi Bagi Pasien pada fluoroskopi<br>Download PDF                | 10 Mutiara: Proteksi Radiasi Bagi Staf Pada Fluoroskopi<br>Download PDF                        |
| Italiano (Italian)      | 10 Regole d'oro: Radioprotezione del paziente in fluoroscopia<br>Download PDF            | 10 Regole d'oro: radioprotezione degli operatori in fluoroscopia<br>Download PDF               |
| 한국어 (Korean)            | 10개 황학: 투시검사 시 환자의 방사선 방어<br>Download PDF  | 10개 황학: 투시검사 시 종사자의 방사선 방어<br>Download PDF   |
| Македонски (Macedonian) | 10 Златни правила: Заштита на пациентите од радијација при флуороскопија<br>Download PDF | 10 Златни правила: Заштита од радијација на персоналот при флуороскопија<br>Download PDF       |
| Монгол үсэг (Mongolian) |  | 10 Шингүүс санам: Рентген харалтын үед ажиглагчид үзүүлэх цацаргийн хамгаалалт<br>Download PDF |
| Polski (Polish)         | 10 zasad: Ochrona radiologiczna pacjenta podczas fluoroskopii<br>Download PDF            | 10 zasad: Ochrona radiologiczna personelu podczas fluoroskopii<br>Download PDF                 |
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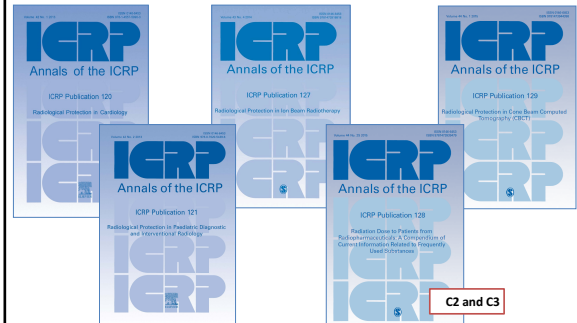
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## ICRP C3 most recent publications

- P120. Radiological Protection in **Cardiology**. Ann. ICRP 42(1), 2013.
- P121. Radiological Protection in **Paediatric Diagnostic and Interventional Radiology**. Ann. ICRP 42(2), 2013.
- P127. Radiological Protection in **Ion Beam** Radiotherapy. Ann. ICRP 43(4), 2014.
- P128. Radiation Dose to Patients from **Radiopharmaceuticals**: A Compendium of Current Information Related to Frequently Used Substances. Ann. ICRP 44(2S), 2015 (with Committee 2).
- P129. Radiological Protection in **Cone Beam** Computed Tomography (CBCT). Ann. ICRP 44(1), 2015.

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## Current Work Plan (a) of Committee 3

- WP on Diagnostic reference levels (DRLs) in Medical Imaging. *In press* (E. Vano).
- WP on Occupational radiation protection issues of interventions guided by radiological imaging. *Undergoing public consultation* (P. Ortiz).
- TG 36 (with C2): Radiation dose to patients from radiopharmaceuticals (D. Nosske and S. Mattsson).
- WP on Radiological Protection in Therapy with Radiopharmaceuticals (Y. Yonekura and S. Mattsson).
- WP (with C1) on Radiological Protection in Medicine in relation to the Individual Response to Ionising Radiation (M. Bourguignon).

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## A new way to visually convey level of dose

Table 4.1. Typical patient dose levels (rounded) from vascular surgical procedures.

| Procedure                                   | Relative mean effective dose to patient |        | Relative mean radiation dose to patient* | Reported values        |                          |   |                      |
|---|---|--------|--|------------------------|--------------------------|---|----------------------|
|   | 0                                       | mSv 35 |  | Fluoroscopy time (min) | Entrance skin dose (mGy) | Dose-area product (Gy·cm <sup>2</sup> ) | Effective dose (mSv) |
| EVAR  |   |        | F,G                                      | 21                     | 330-850                  | 60-150                                  | 8.7-27               |
| Venous access procedures                    |   |        | B  | 1.1-3.5                | 8-24                     | 2.3-4.8                                 | 1.2                  |
| Renal/visceral angioplasty (stent/no stent) |   |        | G  | 20.4                   | 1442                     | 208                                     | 54                   |
| Iliac angioplasty (stent/no stent)          |   |        | G  | 14.9                   | 900                      | 223                                     | 58                   |

Rehani et al. ICRP Publication 117. Radiological protection in fluoroscopically guided procedures performed outside the imaging department. 2010



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Table 4.2. Typical patient dose levels (rounded) from Urological procedures.

| Procedure                | Relative mean effective dose to patient |        | Relative mean radiation dose to patient* | Reported values |
|--------------------------|---|--------|--|-----------------|
|                          | 0                                       | mSv 35 |  |                 |
| IVU/IVP                  |   |        | C,D                                      | na**            |
| Cystometrography         |   |        | B  | n               |
| Cystography              |   |        | B  | n               |
| Excretion urography/MCU  |   |        | C  | n               |
| Urethrography            |   |        | B  | n               |
| PCNL                     |   |        | A  | 6-12            |
| Nephrostomy              |   |        | D  | 1.3-20          |
| ESWL                     |   |        | B  | 2.6-3.4         |
| Kidney stent insertion   |   |        | E  | /               |
| Ureteric stent placement |   |        | E  | /               |

Table 4.6. Typical patient dose levels (rounded) from gastroenterology and hepato-biliary

| Procedure                   | Relative mean effective dose to patient |        | Relative mean radiation dose to patient* | Reported values |
|-----------------------------|---|--------|--|-----------------|
|                             | 0                                       | mSv 35 |  |                 |
| ERCP (diagnostic)           |   |        | C,D                                      | 2-3             |
| ERCP (therapeutic)          |   |        | E,F                                      | 5-10            |
| Biopsy                      |   |        | E  | na**            |
| Bile duct stenting          |   |        | E  | na**            |
| PTC#                        |   |        | D  | 6-14            |
| Bile duct drainage          |   |        | F,G                                      | 12-26           |
| TIPS***                     |   |        | F,G                                      | 15-93           |
| Intrahepatic hepatic biopsy |   |        | D  | 6.8             |

\*A<1 mSv; B=1 to <2 mSv; C=2 to <3 mSv; D=3 to <10 mSv; E=10 to <20; F=20 to <35 mSv; G=35 to <100 mSv; H=100 to <200 mSv; I=200 to <400 mSv; J=400 to <800 mSv; K=800 to <1600 mSv; L=1600 to <3200 mSv; M=3200 to <6400 mSv; N=6400 to <12800 mSv; O=12800 to <25600 mSv; P=25600 to <51200 mSv; Q=51200 to <102400 mSv; R=102400 to <204800 mSv; S=204800 to <409600 mSv; T=409600 to <819200 mSv; U=819200 to <1638400 mSv; V=1638400 to <3276800 mSv; W=3276800 to <6553600 mSv; X=6553600 to <13107200 mSv; Y=13107200 to <26214400 mSv; Z=26214400 to <52428800 mSv; na\*\* not available

Table 4.5. Typical patient dose levels from gynaecological procedures

| Procedure  | Relative mean radiation effective dose to patient |    | Relative mean radiation dose to patient* | Reported values |
|--|---|----|--|-----------------|
|  | 0   | 35 |  |                 |
| Pelvimetry, conventional   |   |    | A  | na**            |
| Pelvimetry, digital  |   |    | A  | 0.2-0.8         |
| fluorography   |   |    | A  | 0.85            |
| CT Pelvimetry  |   |    | A  | 0.10-1.4        |
| HSG  |   |    | A  | na**            |
| UAE***   |   |    | A  | 0.020-1.1       |
| *A<1 mSv; B=1 to <2 mSv; C=2 to <3 mSv; D=3 to <10 mSv; E=10 to <20; F=20 to <35 mSv; G=35 to <100 mSv; H=100 to <200 mSv; I=200 to <400 mSv; J=400 to <800 mSv; K=800 to <1600 mSv; L=1600 to <3200 mSv; M=3200 to <6400 mSv; N=6400 to <12800 mSv; O=12800 to <25600 mSv; P=25600 to <51200 mSv; Q=51200 to <102400 mSv; R=102400 to <204800 mSv; S=204800 to <409600 mSv; T=409600 to <819200 mSv; U=819200 to <1638400 mSv; V=1638400 to <3276800 mSv; W=3276800 to <6553600 mSv; X=6553600 to <13107200 mSv; Y=13107200 to <26214400 mSv; Z=26214400 to <52428800 mSv; na** not available |   |    |  |                 |
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181: General guidelines on risk management in external beam radiotherapy - Technical supplement

180: Medical Radiation Exposure of the European Population (Part 1) - Diagnostic Reference Levels in Thirty-six European Countries (Part 2)

179: Study on the current status of radioactive sources in the EU, on the origin and consequences of loss of control over radioactive sources and on successful strategies concerning the detection and recovery of orphan sources

178: Referral Guidelines for Medical Imaging - Availability and Use in the European Union - Appendices

177: EU Scientific Seminar 2012 - Protection of the Environment

176: Implied doses to the population of the EU arising from reported discharges from EU nuclear power stations and management sites in the years 2006 to 2010

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| 9789241510349_eng.pdf | Communicating radiation risks in paediatric imaging: information to support health care discussions about benefit and risk | 901.98 kB | Adobe PDF |

**Title:** Communicating radiation risks in paediatric imaging: information to support health care discussions about benefit and risk

**Authors:** World Health Organization

**Issue Date:** 2016

**Publisher:** World Health Organization

**Place of publication:** Geneva

**Language:** English

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**United Nations Scientific Committee on the Effects of Atomic Radiation**

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**Publications**

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**UNSCEAR 2016 Report: "Sources, effects and risks of ionizing radiation"**

The **UNSCEAR 2016 Report** comprises the main text of the 2016 report to the General Assembly and four scientific annexes.

- Annex A - Methodology for estimating public exposures due to radioactive discharges
- Annex B - Radiation exposures from electricity generation
- Annex C - Biological effects of selected internal emitters-Tritium
- Annex D - Biological effects of selected internal emitters-Uranium

**Developments since the 2013 UNSCEAR Report on the levels and effects of radiation due to the nuclear accident following the great east-Japan earthquake and tsunami**

The **2016 White Paper** to guide the Scientific Committee's future programme of work (and Japanese)

東日本大震災後の原子力事故による放射線被ばくのレベルと影響に関する**UNSCEAR 2013年報告書**の補足資料として、国連科学委員会による今後の作業計画を示す**2016年白書**（英語版及び日本語版が利用可能）

## International Resources from

- **IAEA**
- **ICRP**
- **European Commission (EC)**
- **WHO, UNSCEAR**
- **Some professional societies:**  
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### Radiation Safety Culture in Medicine

Medical physicists have responsibility for patient protection as described in International Basic Safety Standards (BSS). Additionally, medical physicists may share responsibility for occupational protection, as described in BSS. A series of over exposures in last few years have brought the need for safety culture in use of ionizing radiation in medicine.

While medical physicists in large part of the world are involved in day-to-day strengthening of safety culture, IOMP's role has been in:

- revision of BSS and with its content on Safety Culture
- review of Safety Guide of IAEA and as in training course on implementation of safety guide
- organizing a session in World Congress on Medical Physics & BME, June 2015, Toronto on Implementation of BSS and Safety Culture in Medicine under the lead of Madan Rehani.

Further, IOMP along with IRPA and WHO jointly organized following workshops

1. First Regional Workshop on Radiation Protection Culture in Medicine held in Buenos Aires on 11th April 2015 for Latin American countries. IOMP was represented by Dr Simone Kudulovic Renha represented IOMP. A brief abstract is available here.

**IRPA**  
INTERNATIONAL RADIATION PROTECTION ASSOCIATION

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### Education and Training

IRPA promotes excellence in the practice of radiation protection through national and regional Associate Societies for radiation protection professionals. Education and Training (E&T) is a key factor in establishing effective national radiation protection programmes. The IRPA E&T Plan has three objectives:

- cooperation with international and regional organizations dealing with E&T in Radiation Protection;
- internal stimulation of E&T by organizing discussion forums during IRPA Congresses; and

### Resources

|  |         |            |
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| <a href="#">The role of IRPA in education and training of radiation protection professionals.pdf</a> | 17 kb   | 2012-12-02 |
| <a href="#">IRPA Contribution to E T Activities for Radiation Protection Professionals.pdf</a>       | 2483 kb | 2012-12-02 |

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**European Federation Of Organisations For Medical Physics**

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### Publications

On the page we list the various publications that EFOMP has produced. Our policy statements are produced to offer guidelines on the appropriate general responsibilities, organisational relationships and roles of workers in the field of Medical Physics. They are produced by experts mainly from medical physics societies in Europe. Other documents carry the approval of EFOMP but are not classed as Policy Statements. In addition EFOMP produces a Newsletter and European Medical Physics News, which carry articles of interest to the European Medical Physics Community.

#### EMP News

Latest European Medical Physics annuality

- EMP News Autumn 2016  
EMP News Autumn 2016  
Created on: 23/11/2016
- EMP News Winter 2015  
Created on: 18/10/2015

#### Policy Statements

- Policy Statement No.1  
The European Federation of Organisations for Medical Physics, Policy Statement No. 7.1: The roles, responsibilities and status of the medical physicist including the criteria for the staffing levels in a Medical Physics Department

#### EFOMP Journals

- The official journal of EFOMP is *Physics in Medicine: The European Journal of Medical Physics*
- EFOMP also sponsors 4 other journals:
  - Clinical and Physiological Measurements
  - European Radiology
  - Physics in Medicine and

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## Recap

- RPOP versus ORP
- Resources from IAEA: Free .ppt slides, posters, eLearning material, webinars
- ICRP: Free till P28, some others. Free Educational ppt slides, CD material
- European Commission (EC): Free downloads
- WHO, UNSCEAR: Free downloads
- Some professional societies: IOMP/IRPA/EFOMP: Free material

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# Thank You

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