

# **INTERNATIONAL SYSTEM FOR RADIATION PROTECTION, IAEA SAFETY STANDARDS, IAEA RESOURCES 10-14 November, Trieste, Italy**

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Chadia Rizk

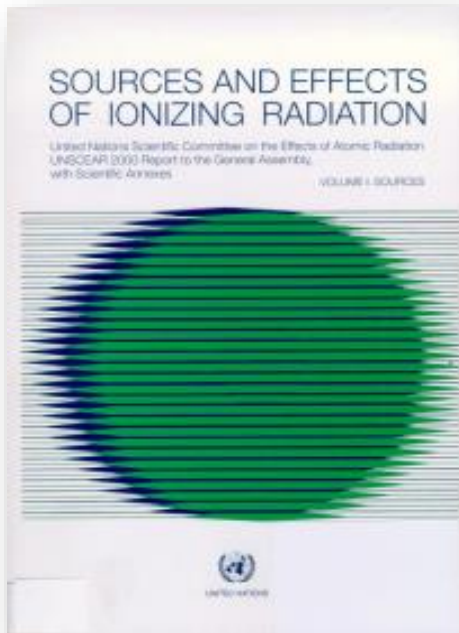
Radiation Protection of Patients Unit

International Atomic Energy Agency, Vienna, Austria

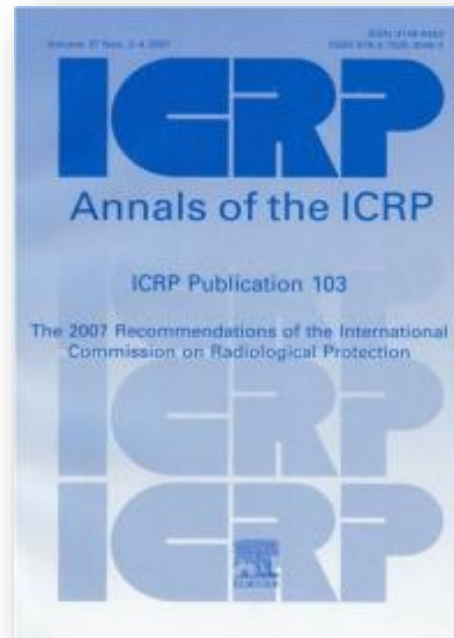


# International system for radiation protection

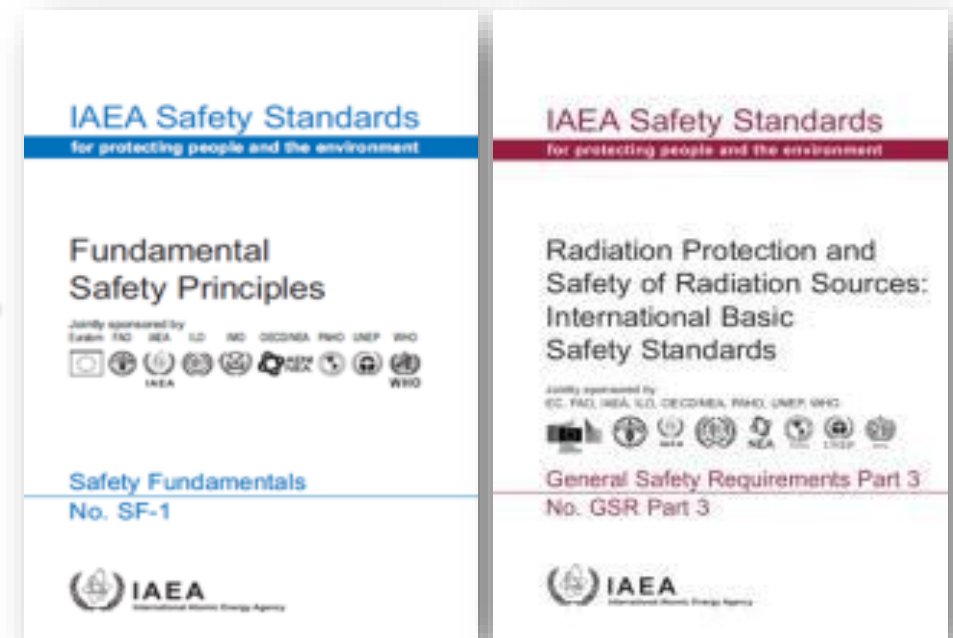
UNSCEAR studies  
effects of atomic  
radiation



ICRP provides  
recommendations for  
protection

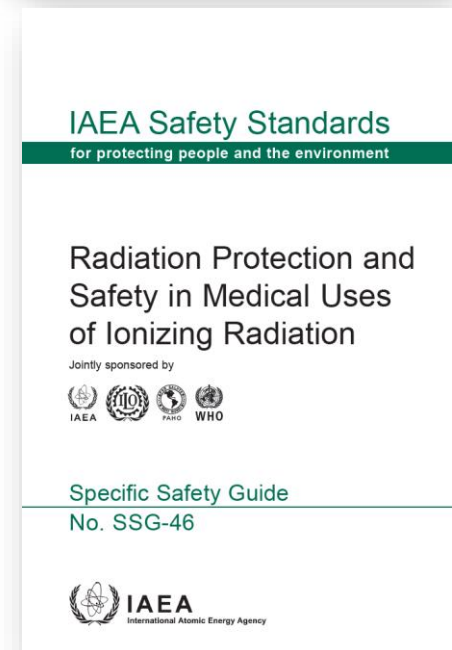
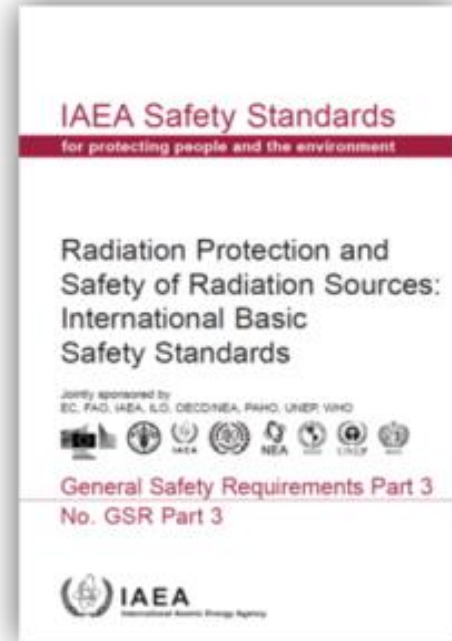


IAEA establishes  
safety standards for  
protection



# IAEA Safety Standards

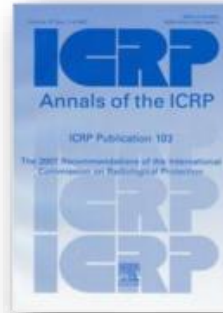
- **GSR Part 3: International Basic Safety Standards (BSS)**
  - Set basic requirements for protection and safety
  - Mandatory for MS receiving technical assistance from the IAEA
  - Used as template for many national regulations
- **Safety Guide on Radiation Protection and Safety in Medical Uses of Ionizing Radiation (SSG-46)**
  - Provides guidance on fulfilling the BSS requirements in medical settings



# International system

## Exposure situations

- Planned
- Emergency
- Existing

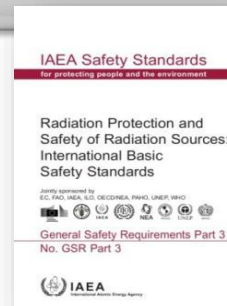


## Categories of exposure

- Medical
- Occupational
- Public

## Principles:

- Justification
- Optimisation
- Dose limitation



## Dose criteria

- Dose limits
- Dose constraints
- Reference levels

## Requisites

- Information
- Assessment of exposure
- Stakeholders involvement

# Safety Guide on Medical Uses SSG-46

- Scope: covers radiological procedures in

Radiology  
(incl. dentistry)



Image guided  
interventional  
procedures



Nuclear  
medicine



Radiation therapy

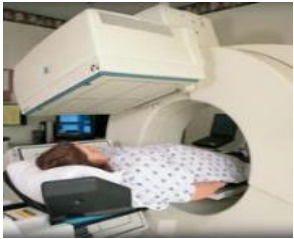


- Within the scope are **all uses for human imaging**, carried out in :
  - other medical specialties, e.g. cardiology, vascular surgery, urology, orthopaedic surgery, obstetrics and gynaecology, emergency medicine, gastroenterology, anaesthetics and pain management.
  - other health care practices (depending on the regulation), such as chiropractic, osteopathy and podiatry.



# GSR Part 3: Categories of exposure

## Medical exposure



## Occupational exposure



## Public exposure



# GSR Part 3: Definitions

## Occupational exposure:

Exposure of workers incurred in the course of their work.



# GSR Part 3: Definitions

## Medical exposure:

### Exposure incurred by:

- **Patients\*** for the purpose of medical or dental diagnosis or treatment
- **Carers and comforters \*\***
- **Volunteers** in a programme of biomedical research involving their exposure

\*A **patient** is an individual who is a recipient of services of health care professionals and/or their agents that are directed at (a) promotion of health; (b) prevention of illness and injury; (c) monitoring of health; (d) maintaining health; and (e) medical treatment of diseases, disorders and injuries in order to achieve a cure or, failing that, optimum comfort and function. Some asymptomatic individuals are included.

\*\***Carers and comforters** are persons who willingly and voluntarily help (other than in their occupation) in the care, support and comfort of patients undergoing radiological procedures for medical diagnosis or medical treatment



# GSR Part 3: Definitions

## Public exposure:

Exposure incurred by members of the public due to sources in planned exposure situations, emergency exposure situations and existing exposure situations, excluding any occupational exposure or medical exposure.



# Exposure Situations

- **Planned** - The situation of exposure that arises from the planned operation of a source or from a planned activity that results in an exposure due to a source
- **Emergency** - A situation of exposure that arises as a result of an accident, a malicious act or other unexpected event, and requires prompt action in order to avoid or reduce adverse consequences
- **Existing** - A situation of exposure that already exists when a decision on the need for control needs to be taken

# Exposure situations (BSS)

	Occupational exposure	Public exposure	Medical exposure
Planned exposure situations	Section 2; Section 3: paras 3.5–3.67 and paras 3.68–3.116	Section 2; Section 3: paras 3.5–3.67 and paras 3.117–3.144	Section 2; Section 3: paras 3.5–3.67 and paras 3.145–3.185
Emergency exposure situations	Section 2; Section 4	Section 2; Section 4	Not applicable
Existing exposure situations	Section 2;	Section 2;	Not applicable

**Medical uses of ionizing radiation are a planned exposure situation.**

This includes situations of potential exposure (that is not expected to occur with certainty, but could result from an accident or from an event or a sequence of events that may occur but is not certain to occur)

# Exposure situations (BSS)

	Occupational exposure	Public exposure	Medical exposure
Planned exposure situations	Section 2; Section 3: paras 3.5–3.67 and paras 3.68–3.116	Section 2; Section 3: paras 3.5–3.67 and paras 3.117–3.144	Section 2; Section 3: paras 3.5–3.67 and paras 3.145–3.185
Emergency exposure situations	Section 2; Section 4	Section 2; Section 4	Not applicable
Existing exposure situations	Section 2; Section 5	Section 2; Section 5	Not applicable

The requirements in respect of medical exposure in planned exposure situations apply to all medical exposures, including **intended, unintended and accidental exposures**.

# GSR Part 3: Definitions

## Radiological procedure (BSS)

- A medical imaging procedure or therapeutic procedure that involves ionizing radiation - such as a procedure in:
  - diagnostic radiology,
  - nuclear medicine
  - radiation therapy
  - planning procedure, image guided interventional procedure or other interventional procedure involving radiation
- delivered by a radiation generator, a device containing a sealed source or an unsealed source, or by means of a radiopharmaceutical administered to a patient.



# GSR Part 3: Definitions

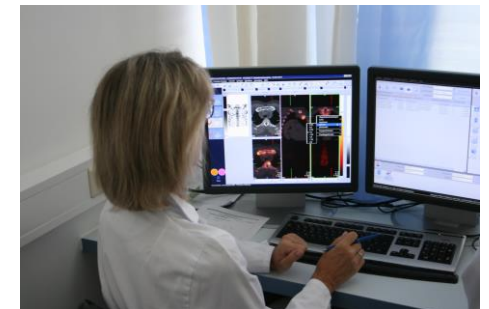
## Medical radiation facilities (BSS):

- A medical facility where radiological procedures are performed
- Medical uses of ionizing radiation take place in:
  - hospitals;
  - medical centres;
  - health clinics,
  - specialist clinics;
  - dental practices
- A medical facility may provide services for one or more medical uses of ionizing radiation

# GSR Part 3: Definitions

## Medical radiation facilities (BSS):

- Nuclear medicine facility:
  - Any medical radiation facility where nuclear medicine procedure is performed (imaging and therapy)
  - Department inside a wider hospital or medical centre
  - Stand-alone facility
  - Mobile facility



# GSR Part 3: Responsibilities

## Government:

Req 2: Establishment of a legal and regulatory framework

Req 34: specific to medical exposure – to ensure, as a result of consultation between Health

Authorities, professional bodies and the Regulatory Body, that:

- DRLs are established
- Dose constraints are established for
  - Carers and comforters
  - Volunteers in biomedical research
- Criteria and guidelines are established for the release of patients after radionuclide therapy

# GSR Part 3: Responsibilities

## Regulatory body

Req 3: Establish or adopt regulations and guides for protection and safety and shall establish a system to ensure their implementation.

Req 35: Ensure that the authorization for medical exposures to be performed at a particular medical radiation facility allows personnel (radiological medical practitioners, medical physicists, medical radiation technologists and any other health professionals with specific duties in relation to the radiation protection of patients) to assume the responsibilities specified in these Standards only if they:

- (a) Are specialized in the appropriate area;
- (b) Meet the respective requirements for education, training and competence in radiation protection.

## GSR Part 3: Responsibilities

Person or organization responsible for facilities / activities that gives rise to radiation

Req 4: have the prime responsibility for protection and safety, which cannot be delegated



# GSR Part 3: Responsibilities

Req 36: **Registrants and licensees** shall ensure that no Patient/Individual incurs a medical exposure unless:

Patient	Volunteer in biomedical research	Carer or comforter
Appropriate referral	Programme approved by ethics committee	Carer or comforter has received, and understood, information on radiation protection and on risks
Medical exposure justified		
Radiological medical practitioner has assumed responsibility for protection & safety	Radiological medical practitioner has assumed responsibility for protection & safety, and dose constraints are applied	Dose constraints are applied
Patient informed of expected benefits & risks		

# GSR Part 3: Responsibilities

Req 36: Registrants and licensees shall ensure that:

- (a) The radiological medical practitioner performing or overseeing the radiological procedure has assumed responsibility for ensuring overall protection and safety for patients in the planning and delivery of the medical exposure, including the justification of the radiological procedure ..and the optimization of protection and safety, in cooperation with the medical physicist and the medical radiation technologist ..;
- (b) Radiological medical practitioners, medical physicists, medical radiation technologists and other health professionals with specific duties in relation to protection and safety for patients in a given radiological procedure are specialized in the appropriate area;

# GSR Part 3: Responsibilities

Req 36: Registrants and licensees shall ensure that:

(c) Sufficient medical personnel and paramedical personnel are available as specified by the health authority;

(d) For therapeutic radiological procedures, the requirements of these Standards for calibration, dosimetry and quality assurance, including the acceptance and commissioning of medical radiological equipment.. are fulfilled by or under the supervision of a medical physicist;

# GSR Part 3: Responsibilities

Req 36: **Registrants and licensees** shall ensure that:

(e) For diagnostic radiological procedures and image guided interventional procedures, the requirements of these Standards for medical imaging, calibration, dosimetry and quality assurance, including the acceptance and commissioning of medical radiological equipment.. **are fulfilled by or under the oversight of or with the documented advice of a medical physicist**, whose degree of involvement is determined by the complexity of the radiological procedures and the associated radiation risks;

(f) Any **delegation of responsibilities** by a principal party is documented.

# Education, training and competence

- **Crucial role to radiation protection in medical exposure**
  - Radiological medical practitioner
  - Medical physicist
  - Medical radiation technologist
  - Radiopharmacist
- All definitions have a similar format: A health professional, with education and specialist training in ....., competent to ..... .
- Explanatory note to each definition:
  - Competence of persons is normally assessed by the Member State by having a formal mechanism for registration, accreditation or certification of ....
  - Member States that have yet to develop such a mechanism need to assess .... based either on international accreditation standards or standards from another country ....



# GSR Part 3: Definitions

## Medical physicist

A health professional with specialist education and training in the concepts and techniques of applying physics in medicine and competent to practise independently in one or more of the subfields (specialties) of medical physics



Competence of persons is normally assessed by the State by having a formal mechanism for registration, accreditation or certification of medical physicists in the given specialty. States that have yet to develop such a mechanism need to assess the education, training and competence of any individual ...and to decide, ...whether such an individual could undertake the functions of a medical physicist, within the required specialty.

# GSR Part 3: Definitions

## Qualified expert

An individual who, by virtue of certification by appropriate boards or societies, professional licence or academic qualifications and experience, is duly recognized as having expertise in a relevant field of specialization, e.g. medical physics, radiation protection, occupational health, fire safety, quality management or any relevant engineering or safety specialty.

## Radiation Protection Officer

A person technically competent in radiation protection matters relevant for a given type of practice who is designated by the registrant, licensee or employer to oversee the application of regulatory requirements.

# GSR Part 3: Definitions

## Referring medical practitioners

A health professional who, in accordance with national requirements, may refer individuals to a radiological medical practitioner for medical exposure



# GSR Part 3: Roles and responsibilities



## State (Government)

- Health authority
- Regulatory body
- Professional bodies

## Academic Institutions and training bodies



## Medical radiation facility

- Registrant or licensee/employer
- Radiological medical practitioner
- Medical radiation technologist
- Medical physicist
- Radiopharmacists, Dosimetrists, Engineers, IT specialist
- Ethic committee



- ▶ Suppliers of sources, equipment and software
- ▶ Maintenance and servicing organizations



## Referring medical practitioners



# Principles of radiation protection

- Justification of practice



- Optimization of protection and safety



- Limitation of doses





# GSR Part 3: Limitation of doses

## Application to occupational and public exposure

Dose limits apply to occupational exposure and public exposure arising from any use of ionizing radiation



## Application to medical exposure

Limitation of doses **do not apply** to medical exposure - exposure of patients, carers or comforters, and volunteers as part of a programme of biomedical research.



# GSR Part 3: Justification

## Application to occupational and public exposure

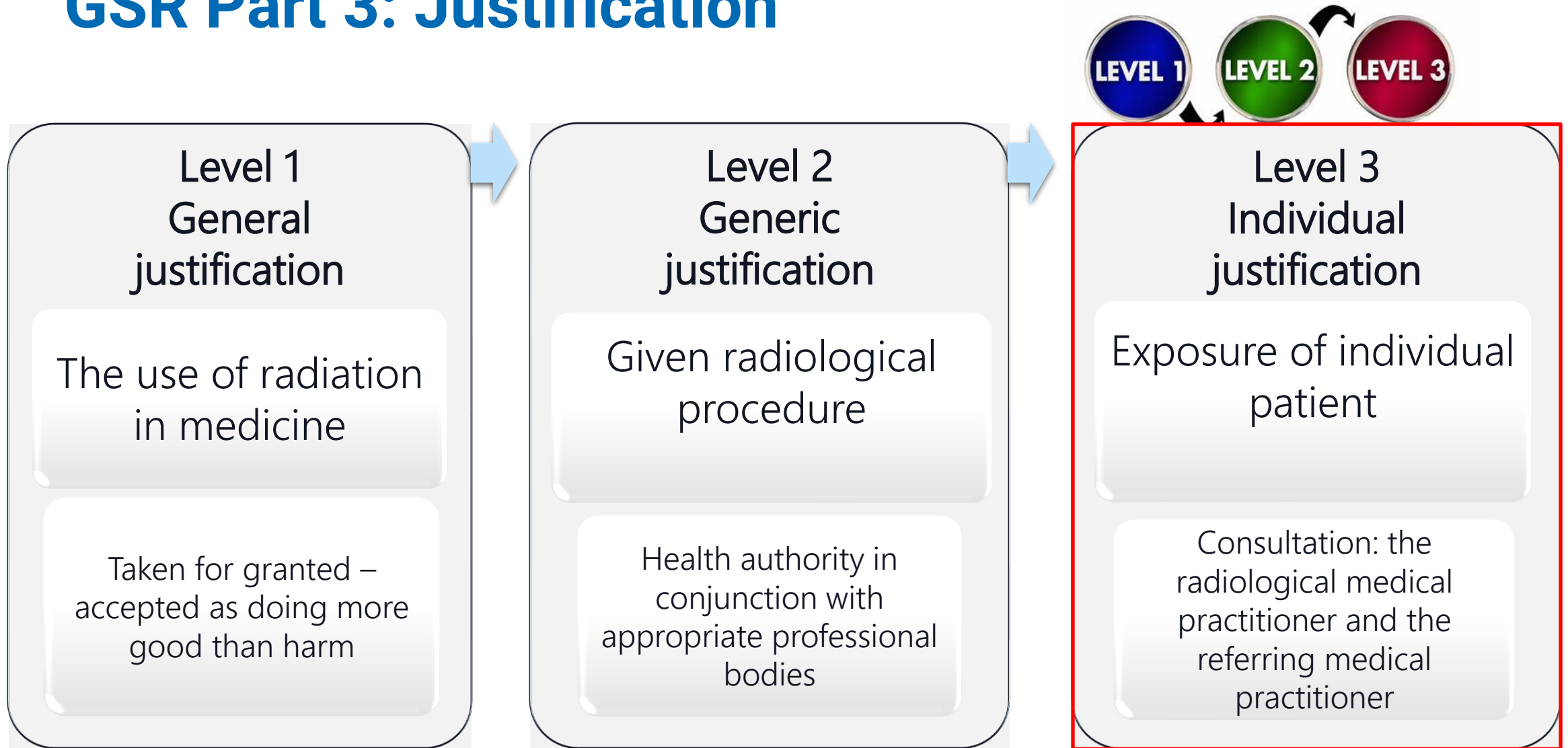
### Justification of practices:

A practice that entails exposure to radiation should only be adopted if it yields sufficient benefit to the exposed individuals or to society to outweigh the radiation detriment.

## Application to medical exposure

**Justification:** The diagnostic or therapeutic benefits produced by exposures are weighed against the radiation detriment they might cause, taking into account the benefits and risks of available alternative techniques that do not involve medical exposure.

# GSR Part 3: Justification



# GSR Part 3: Justification for an individual patient

- With account taken of:
  - Appropriateness of the request
  - Urgency of the procedure
  - Characteristics of the exposure
  - Characteristics of the individual patient
  - Relevant information from previous radiological procedures

☞ Particular attention to be taken for patients who are pregnant or breast-feeding or are paediatric



☞ Relevant national or international referral guidelines shall be taken into account



# GSR Part 3: Justification for asymptomatic individuals

As part of an approved health screening program

The health authority in conjunction with appropriate professional bodies

For the early detection of disease, but not part of an approved health screening programme

Specific justification for that individual by the radiological medical practitioner and the referring medical practitioner, in accordance with the guidelines of relevant professional bodies or the health authority.

As part of this process, the individual shall be informed in advance of the expected benefits, risks and limitations of the radiological procedure.

# GSR Part 3: Optimization

## Application to occupational and public exposure, and to carers and comforters

Providing the best available protection and safety measures under the prevailing circumstances, so that the magnitudes and likelihood of exposures and the numbers of individuals exposed be as low as reasonably achievable (ALARA), economic and social factors being taken into account.

## Application to medical exposure of patients and volunteers as part of a programme of biomedical research

In **diagnostic and interventional medical exposure**, keeping the exposure of patients to the minimum necessary to achieve the required diagnostic or interventional objective.

In **therapeutic medical exposure**, keeping the exposure of normal tissue as low as reasonably achievable consistent with delivering the required dose to the planning target volume.

# GSR Part 3: Optimization

Particular aspects of medical exposures are considered in the optimization process for:

- Paediatric patients subject to medical exposure
- Individuals subject to medical exposure as part of an approved health screening programme
- Volunteers subject to medical exposure as part of a programme of biomedical research
- Relatively high doses to the patient
- Exposure of the embryo or fetus
- Exposure of a breastfed infant as a result of a female patient having undergone a radiological procedure with radiopharmaceuticals





# GSR Part 3: Optimization

Registrants and licensees and radiological medical practitioners shall ensure that protection and safety is optimized for each medical exposure

## Components to consider:

- Design considerations for equipment
- Calibration
- Quality assurance
- Dosimetry of patients
- Diagnostic Reference Levels (DRLs)
- Operational considerations
- Dose constraints (for carers and comforters)

# GSR Part 3: Radiological review

**Radiological review:** A systematic examination or review of the radiological procedures being performed in a given medical radiation facility, that seeks to improve the local implementation of the radiation protection principles of justification and optimization.

- Responsibility of the **radiological medical practitioners**

# Optimization of Protection (summary)

Components	Responsibility
Equipment design and software	Manufacturer, Supplier, Licensee
Calibration	Manufacturer, Maintenance, Medical physicist
Quality assurance and quality control	Medical physicist, Radiographer, Radiologist
Dosimetry of patients and DRLs	Medical physicist, Radiographer, Radiologist,
Protocols (technique and parameters)	Radiographer, Radiologist, Medical physicist
Dose constraints for carers or comforters	Licensee, Radiation Protection Officer
Radiological review (Clinical audit)	Radiologist, Medical physicist, Radiographer
Records keeping	Licensee, Staff

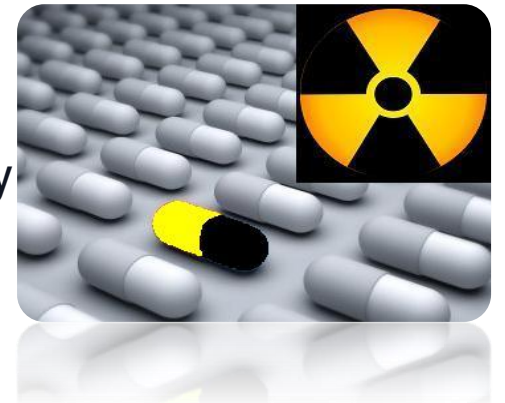
# GSR Part 3: Release of patient after radiopharmaceutical therapy

Req 40: The radiological medical practitioner shall ensure that no patient who has undergone a therapeutic procedure with sealed sources or unsealed sources is **discharged from a medical radiation facility** until it has been established by either a medical physicist or the facility's radiation protection officer that:

(a) The activity of radionuclides in the patient is such that doses that could be received by **members of the public and family members would be in compliance with the requirements set by the relevant authorities**

(b) The patient or legal guardian of the patient is provided with:

- **Written instructions** for keeping doses to persons in contact with or in the vicinity as reasonably achievable and for avoiding the spread of contamination
- **Information** on the radiation risks.



# GSR Part 3: Prevention and mitigation of accidents

## Req 9: Registrants and licensees

- (a) Shall establish **clear lines of responsibility and accountability** for protection and safety for the sources for which they are authorized, and shall establish **organizational arrangements**;
- (c) Shall, ....conduct ..a **safety assessment** and keep it up to date...;
- (f) Shall have in place **operating procedures** and arrangements for protection and safety that are subject to periodic review and updating under a management system;
- (g) Shall establish **procedures for reporting on and learning from accidents** and other incidents;
- (h) Shall establish arrangements for the **periodic review** of the overall effectiveness of the measures for protection and safety;

# GSR Part 3: Prevention and mitigation of accidents

Req 15: Registrants and licensees shall apply good engineering practice and shall take all practicable measures to **prevent accidents and to mitigate** the consequences of those accidents that do occur.

- Registrants and licensees shall ensure that a multilevel (defence in depth) system of sequential, independent provisions for protection and safety that is commensurate with the likelihood and magnitude of potential exposures is applied. Such defence in depth shall be applied for the purposes of:
  - Preventing accidents;
  - Mitigating the consequences of any accidents that do occur;
  - Restoring the sources to safe conditions after any such accidents.

# GSR Part 3: Unintended or accidental medical exposures

Req 41: Registrants and licensees shall ensure that all practicable measures are taken to **minimize the likelihood** of unintended or accidental medical exposures, arising from:

- flaws in design and operational failures of medical radiological equipment,
- from failures of and errors in software,
- as a result of human error.

# GSR Part 3: Unintended or accidental medical exposures

Req 41: Registrants and licensees shall **promptly investigate** any of the following unintended and accidental medical exposure:

- Any medical treatment:
  - delivered to the wrong individual or to the wrong tissue or organ of the patient, or using the wrong radiopharmaceutical, or
  - with an activity, a dose or dose fractionation differing substantially from (over or under) the values prescribed by the radiological medical practitioner, or
  - that could lead to unduly severe secondary effects.



# GSR Part 3: Unintended or accidental medical exposures

Req 41:Registrants and licensees shall promptly investigate any of the following unintended and accidental medical exposure:

- Any procedure in which the wrong individual or the wrong tissue or organ of the patient is subject to exposure; or exposure is substantially greater than was intended;
- Any inadvertent exposure of the embryo or fetus in the course of performing a radiological procedure;
- Any failure of medical radiological equipment, failure of software or system failure, or accident, error, mishap or other unusual occurrence with the potential for subjecting the patient to a medical exposure that is substantially different from what was intended.

# GSR Part 3: Unintended or accidental medical exposures

Req 41: Registrants and licensees shall :

- Calculate or estimate the doses received and the dose distribution within the patient;
- Indicate and implement corrective actions to prevent the recurrence;
- Produce and keep a written record that states the cause of the unintended or accidental medical exposure and includes the information on dose calculation and corrective measures
- For significant unintended or accidental medical exposures or as otherwise required, submit this written record, as soon as possible, to the regulatory body, and to the relevant health authority if appropriate;
- Inform the referring medical practitioner and the patient or the patient's legal authorized representative of the unintended or accidental medical exposure.



**IAEA**

# **Overview of IAEA -RPOP resources**

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# Providing Specific guidance on implementation (Safety Reports, TecDoc)



SPESS F  
Document Preparation Profile (DPP)  
Version 1 dated 2023-05-08

IDENTIFICATION  
Document category: TECDOC  
Working ID: [leave blank until approval by the Coordination Committee]  
Proposed Title: Detection of Unintended or accidental Medical Exposures in Radiotherapy Through Patient Response and Recommendations  
Proposed Action: New document  
Review Committee(s) or Group: n/a  
Technical Officer(s): Venna Gershon and Ola Holmberg, NSRW

IAEA TECDOC SERIES

Detection of unintended or accidental medical exposures in radiotherapy through patient response and recommendations

SAFETY REPORT SERIES No. XXX

EDUCATION AND TRAINING FOR BUILDING AND MAINTAINING COMPETENCE IN RADIATION PROTECTION IN MEDICINE

Jointly sponsored by the International Atomic Energy Agency and World Health Organization (invited to co-sponsor)

Endorsed by Professional organizations (ESTRO, DITTA, FDI World Dental Federation, IADMF, IOMP, ISR, ISRT, IUPESM, WEO, WFNMB, WONCA)

Version 22 April 2025

IAEA International Atomic Energy Agency

# Providing guidance and Building awareness-Public website



## [Radiation Protection of Patients \(RPOP\) | IAEA](#)

- Available in English and in Spanish
- 1.5 Million views per year



# Providing guidance and Building awareness-Posters

## 10 Pearls: Radiation protection of **patients** in CT

1. Perform scan only if it is indicated!  
It is estimated that a significant number of imaging examinations are unnecessary.  
Consultation between the referring physician and the radiologist is recommended.
2. Encourage use of alternative non-ionizing imaging (MRI/US) when appropriate, especially in younger patients.
3. Always check if patient may be pregnant.  
Use special signs and informative material notifying patients that they MUST disclose any possibility of pregnancy.
4. High quality /Crisp images may look nice but they impart higher radiation doses to patients.  
Start using images with some noise without loss of diagnostic information.
5. Use indication-specific CT protocols for each body region, e.g. for lung nodule follow up or kidney stones, diagnostic images can be obtained at 50-75% lower radiation dose compared to routine or general use protocols.

Image Quality: Unacceptably high | Image Quality: Acceptable for diagnosis | Image Quality: Acceptable for diagnosis

Revised Patient! 10 Pearls: Appropriate referral of CT examinations  
http://www.rpop.iaea.org

## 10 Pearls: Appropriate referral for CT examinations

1. Avoid inappropriate examinations by asking yourself:  
A. Has it been done already?  
B. Do I need it?  
C. Do I need it now?  
D. Is this the best examination?  
E. Have I explained the clinical problem?
2. Discussion with the radiologist may help strengthen the justification process and reduce unhelpful imaging.
3. Inform and discuss with the patient the benefits and risks of the examination.
4. Keep informed about the appropriateness criteria and refer guidelines and use them in daily practice.

Diagnostic Imaging Pathways  
ACR Appropriateness Criteria®

Revised Patient! 10 Pearls: Appropriate referral of CT examinations  
http://www.rpop.iaea.org

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

1. Remember: Some tissues of a growing child are more sensitive to radiation than adult.  
Children have longer life span to manifest radiation effects.
2. Discuss with parents before the procedure.  
• Ask about previous exposures  
• Answer their concerns about radiation safety.
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.

Revised Patient! 10 Pearls: Radiation protection for children in interventional procedures  
http://www.rpop.iaea.org

## 10 Pearls: Radiation protection of **staff** in fluoroscopy

1. Use protective devices!  
Advisable skirt type lead apron to distribute weight  
0.25 mm lead equivalence  
front to make it 0.5 mm on the back (Provides >90% protection)
2. Make good use of time-distance-shielding (TDS) principle.  
Minimize time  
Maximize distance as much as clinically possible  
Use shielding
3. Use ceiling suspended screens, lateral shields and table curtains.  
They provide more than 90% protection from scattered radiation in fluoroscopy.  
Mobile floor shielding is advisable when using cine acquisition.
4. Keep hands outside the primary beam unless totally unavoidable.  
Hands inside the central area of the primary beam will increase exposure factors (kV, mA) and doses to patient and staff.

Revised Patient! 10 Pearls: Radiation protection of staff in fluoroscopy  
http://www.rpop.iaea.org

## 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.  
Keep records of fluoroscopy time and DAP/KAP (if available) for every patient.
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.  
Vary the beam entrance port by rotating the tube around the patient.

Revised Patient! 10 Pearls: Radiation protection of patients in fluoroscopy  
http://www.rpop.iaea.org

## Explaining the Check, Review and Report Process

### Individual Checks

As part of the time-out procedure, all team members should ask three questions:

- Correct Patient?
- Correct Plan?
- Correct Staff?
- Correct Set-up?

### Team Review

The Team Review process requires timely communication among all of the team members that are involved, especially if required. Team review comprises a full discussion of the case to ensure that all team members are aware of the case, the planned interventions, and the resources available for the procedure.

### Report

Know the policies for reporting any issues to other team members. Internal or external reporting is essential in ensuring that information is shared and that any issues are addressed in a timely manner.

## Pregnant?

or think you could be?

Please tell the staff before an X ray or nuclear medicine procedure

## What you need to know

Unborn babies are more sensitive to radiation.

Risk depends on stage of pregnancy, type of procedure and the amount of radiation used.

Diagnostic radiological procedures are safe under most circumstances even during pregnancy.

## DO's and DON'Ts

Don't avoid the procedure if it's important for your health.

Do ask the medical staff what measures will be taken to reduce any risks.

Do seek advice before the procedure if you are concerned.

Do ask if a pregnancy test is needed.

FOR MORE INFORMATION VISIT: <http://www.rpop.iaea.org>

## Why routine patient contact shielding is no longer needed

### What is patient contact shielding?

Patient contact shielding involves placing a protective layer or barrier, usually made of lead or similar material, over parts of your or your child's body that are not being imaged during X ray examinations such as radiography, fluoroscopy or computed tomography.

In recent years our understanding of the use of routine patient contact shielding has changed.

### What we now know

X ray equipment has improved, dramatically reducing the amount of radiation being delivered during X ray examinations.

Incorrect or unintended placement of shielding in relation to the body part being imaged can obscure important details, leading to repeated examinations.

Shielding materials can also interfere with the automatic dose control of the equipment, increasing the dose and reducing image quality, and might lead to a need for repeat examination.

Shielding parts of the body not being imaged does not impact the very low doses of radiation that have already entered and scattered within the body during the imaging.

Reusing the same shields can lead to hygiene problems.

For these reasons, routine patient contact shielding is no longer recommended. Staff take many other measures to limit your or your child's radiation dose.

### Can there be exceptions?

Staff may still provide shielding to cover parts of the body that are outside the area that needs to be evaluated, in certain situations or upon request. It can be helpful to discuss such exceptions with the staff.

### What if I'm pregnant?

Sometimes X ray examinations are deemed medically necessary during pregnancy. In such cases, staff will take additional precautions and will assess whether shielding is necessary or not.

The essential first step is to inform the staff if you are pregnant or might be pregnant before the examination, so they can take any additional precautions. This may include considering delaying procedures or taking other measures to keep any X ray dose to the unborn child as low as possible.

### Why do I have to wear a shield while my child is being X rayed?

The X ray examination prescribed by your doctor is to help diagnose and treat your child. Even though the exposure to others in the area is very, very low, regulations very often require that anyone who is not being examined wears shields such as a lead apron.

### Why do staff still wear aprons?

Since staff are regularly exposed to radiation as part of their job and not for their own medical benefit, it is important for them to minimise their X ray dose. That is why you will still see them wearing protective aprons.

### Still have concerns?

Ask medical staff what measures will be taken to reduce your or your child's radiation dose and if shielding can be applied.



RPOP  
Radiation  
Protection  
of Patients

Further information



# Providing guidance and Building awareness-Videos

Medical imaging: The right test at the right time



<https://youtu.be/0USC0C6qG9w>

Medical imaging in pregnancy



<https://youtu.be/2gQbR4gVXM8>

Safe medical imaging for children



<https://youtu.be/Zcs0MFMHkm>

Protecting patients in dentistry



<https://youtu.be/ub1AcfVHn7w>



# Providing Training- Training Packages



Training material

[Training material | International Atomic Energy Agency](#)

- Diagnostic and interventional radiology
- Digital radiology
- Paediatric radiology
- Radiation dose management in CT
- Radiotherapy
- Radiotherapy: Prevention of accidental exposure
- Safety and quality in radiotherapy
- Nuclear medicine
- Cardiology
- PET/CT
- Doctors using fluoroscopy outside radiology
- Dental radiology
- Radiation Safety Culture Trait Talks Handbook
- RP in Interventional Procedures: Practical Tutorials

# Providing Training- eLearnings



Online training in radiation protection

[Online training in radiation protection | IAEA](#)

1. Diagnostic Reference Levels in Medical Imaging (English, Spanish)
2. Tips & Tricks: RP in Radiography (English)
3. Safety and Quality in Radiotherapy (English, Russian, Spanish)
4. Radiation Dose Management in CT (English, Russian, Spanish)
5. RP in fluoroscopy guided interventional procedures (English)
6. RP in Interventional Procedures: Practical Tutorials (English, Russian, Spanish)
7. RP in Dental Radiology (English, Spanish)
8. RP in Nuclear Medicine (English)



# Providing Training- Webinars



Webinars in radiation protection

[Webinars in radiation protection | IAEA](#)

## Invitation to join IAEA webinar

14 October 2025, 14:00–15:00 (CEST)



JOIN US ONLINE | PARTICIPATION IS FREE

## Artificial Intelligence in Radiation Protection of Patients: Utilities in Diagnostic and Interventional Radiology

Presented by Ehsan Samei (USA), Laurens Topff (Netherlands) and Annalisa Trianni (Italy)

# Providing Training- Training courses

Search

Search in Conferences:

Overview

Programme

Speakers

Apply here

Practical info

## Joint ICTP-IAEA Workshop on Radiation Protection in Diagnostic and Therapeutic Nuclear Medicine | (smr 4112)

🕒 Starts 10 Nov 2025  
Ends 14 Nov 2025  
Central European Time

📍 ICTP

Kastler Lecture Hall (AGH)  
Adriatico Guest House  
Riva Massimiliano e Carlotta, Grignano  
I - 34151 Trieste (Italy)

*An ICTP-IAEA meeting*

The workshop provides specialized training on safety standards and best practices for radiation protection of patients and staff in nuclear medicine, thereby supporting the reduction of potential radiation risks and fostering a strong safety culture while ensuring optimal patient care.

The clinical applications of nuclear medicine procedures are rapidly expanding, offering substantial benefits to patients. However, the introduction of new technologies, procedures, and radiopharmaceuticals necessitates specific safety measures to ensure the radiation protection of both patients and staff.

This workshop is designed to enhance knowledge and facilitate the exchange of expertise to ensure the safe application of nuclear medicine techniques in both diagnosis and treatment, while addressing the challenges and risks posed by the continuous evolution in this field.

Primarily targeted at experienced clinical medical physicists in nuclear medicine, this workshop is particularly relevant for those from departments planning to introduce new methods or radiopharmaceuticals into clinical practice. Participants are expected to present their department's radiation protection programme.

Topics

- Nuclear medicine facility planning and shielding calculations
- Management of radioactive materials and radiation waste
- Workplace and personal dose monitoring practices
- Radiation protection during the production and administration of radiopharmaceuticals
- Practical strategies for optimizing radiation protection of patients and staff members

Support

✉ [smr4112@ictp.it](mailto:smr4112@ictp.it)

## International Workshop on Radiation Protection Optimization in Fluoroscopy Guided Interventional Procedures

April 15, 2024 – April 19, 2024

Location: [Argonne National Laboratory, Lemont, IL, USA](#)

### Information

- 📅 Agenda
- 📁 Event Materials (protected)
- 📷 Photos (protected)

### Tools

- 📤 Upload

### Resources

- 📄 FAQ sheet (Participants)
- 📄 Intro PPT Template (Participants)
- 📄 Presentation Guidance (Speakers)

### Argonne Information

- 👤 Visiting Argonne
- 🗺 Argonne Map
- 📺 Argonne Videos

### Local Area Information

- 🏨 Hotel & Dining

### Introduction

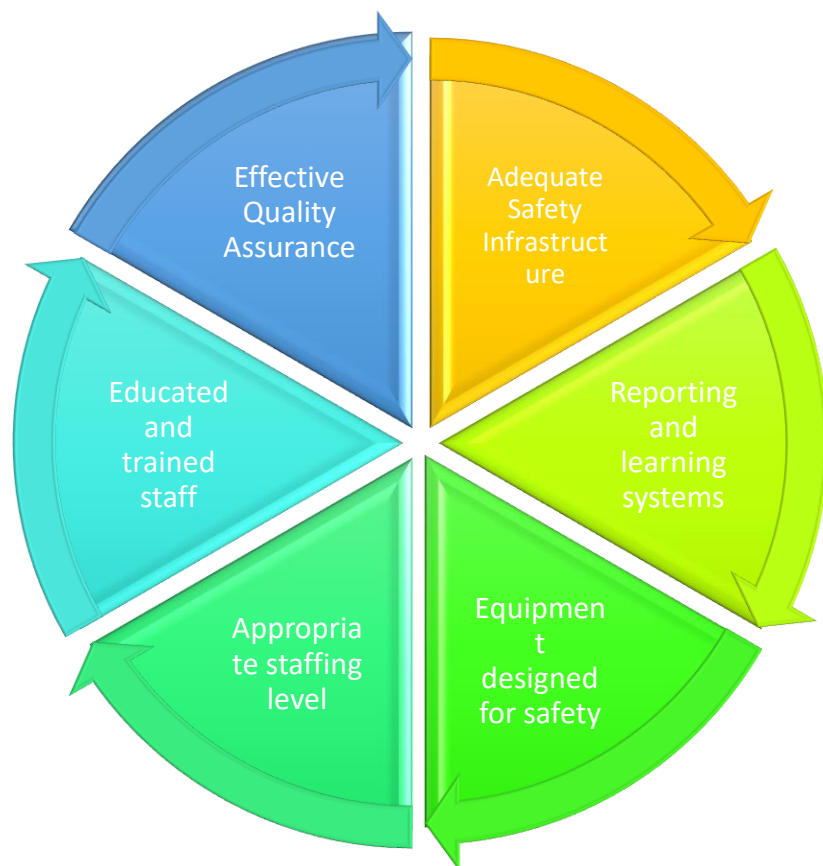
Fluoroscopically guided interventional (FGI) procedures provide an excellent alternative to many surgical interventions. In addition to the traditional performers as interventional radiologists and cardiologists, these procedures are increasingly performed by physicians of other medical and surgical specialties, e.g. neurosurgeons, vascular surgeons, orthopedic surgeons, urologists, or gastroenterologists, involving also other medical staff (nurses, anesthesiologists, etc.) who have limited or no training in radiation technology and radiation protection. The increase of variety, frequency and complexity of these procedures and the involvement of non-trained staff pose many challenges for both patient and medical staff radiation protection. Particular challenges are the risk of tissue reactions, mainly skin injuries and eye lens opacities, for patients and staff. The International Basic Safety Standards (IAEA GSR Part 3) set requirements for ensuring safe use of radiopharmaceuticals and radiation protection and safety for patients and staff in interventional procedures, which are further emphasized in the Implementation Safety Guide SSG-46 of the IAEA and related technical documents.

### Objectives

The overall objective of the workshop is to enhance participants' knowledge of safety standards and good practice regarding radiation protection of patients and staff in image guided interventional procedures, as well as to support the improvement of their practical skills and competence in the field.

Participants will acquire the necessary knowledge and skills to manage patient and staff dose and image quality in FGI procedures. They will learn about components to be in place in order to optimize procedures, including selection of design features of a fluoroscopy system consistent with the intended clinical use; proper configuration and exposure setting optimization at the time of commissioning of the system, tailored to the clinical tasks and required image quality; setting a comprehensive quality assurance and patient dose monitoring programme and optimal use of the available equipment features and settings by the operators to reduce exposure to patient and staff. Prevention and management of tissue reaction and setting follow-up program will be also discussed.

# Facilitating Knowledge Exchange- Safety initiatives



International study of patient doses and tissue reactions from fluoroscopy guided interventional procedures

June 2022 – May 2023

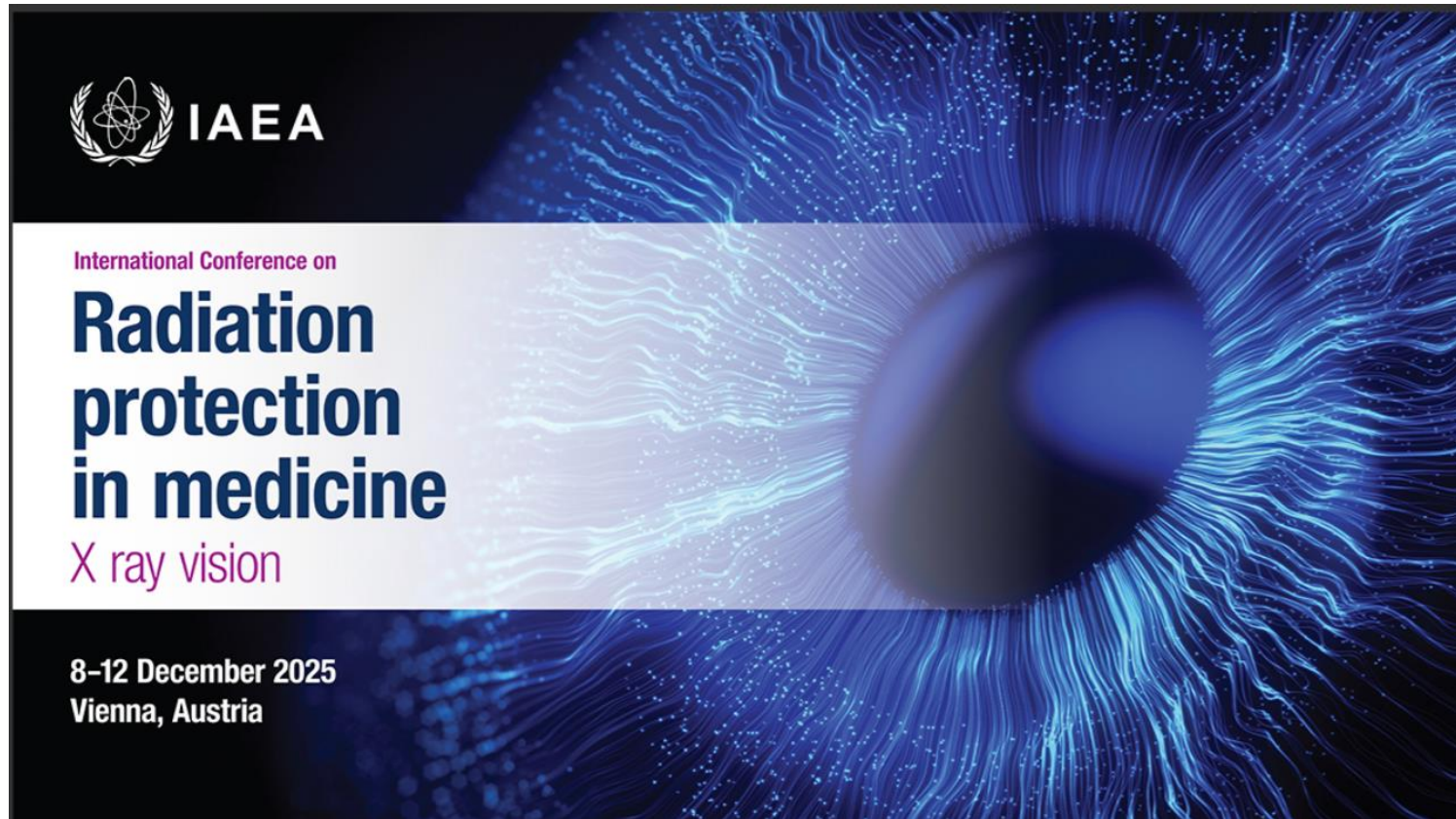


[Databases and learning systems in radiation protection | International Atomic Energy Agency](#)



# Facilitating Knowledge Exchange- International Conferences

International Conference on Radiation Protection in Medicine: [X Ray Vision](#)



[Home: International Conference on Radiation Protection in Medicine: X Ray Vision | IAEA](#)

# Facilitating Knowledge Exchange- Technical meetings

Radiation Protection of Patients in the New Era of Medical Imaging, 4 - 6 March 2024



Radiation Protection Challenges in Modern Nuclear Medicine, 3 – 5 March 2025





# IAEA information and learning resources





# Thak you!

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[c.rizk@iaea.org](mailto:c.rizk@iaea.org)