

The Importance of Education and Training

TG 117 Digital Workshop – 18th September 2023

Radiological Protection in PET and PET/CT

Chapter 10 – Education in Radiological Protection

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All health professionals that work with PET/CT or PET/MR have to be proficient:

In the procedures

&

In **radiological protection and safety**

To guarantee safety for patients, workers and the public in general

Aim

Revise International Guidance & Regulations

Responsibilities:

- Regulator
- Institution
- Health Professional



Educational needs:

- Formal Education
- Practical Training
- Continuous Professional Development

Provide a framework for education in RP&S

Outline

- Sources of guidance
- Standards in Radiation Protection & Safety
- Syllabus for Educational Programs
 - Subchapter 10.2
- Responsibilities regarding Education & Training
 - Subchapter 10.3
- Areas of Education & Training
 - Subchapters 10.4 to 10.6
- Final remarks
 - Subchapter 10.7

Sources of Guidance

- International Commission on Radiological Protection (ICRP)
- International Atomic Energy Agency (IAEA)
- World Health Organization (WHO)

- European Commission (EC)
- European Union Training and Education in Radiation Protection (EU TERP) Foundation
- Heads of European Radiological Protection Competent Authorities (HERCA)

Standards on RP&S Regulatory Responsibilities

ICRP Publication 103 (2007)

- The 2007 Recommendations of the International Commission on Radiological Protection

ICRP Publication 105 (2007)

- Radiological Protection in Medicine

IAEA - Radiation Protection and Safety of Radiation Sources: International Basic Safety 4747 Standards. General Safety Requirements (No. GSR Part 3) (BSS)

IAEA & WHO – Bonn Call for Action -

<https://www.iaea.org/resources/rpop/resources/bonn-call-for-action-platform>

EU Council Directive 4762 2013/59/EURATOM

ICRP Publication 113 (2009)

- Education and training in radiological protection for diagnostic and interventional procedures

EC Radiological Protection N. 175 (2014)

- Education and training in radiological protection for diagnostic and interventional procedures

Detailed **contents** and **levels of knowledge** and expertise
for **different categories of health professionals**

Orientation for Credentialing Entities for education in radiological protection

Table 10.1. Recommended radiological protection training requirements for different categories of personnel (ICRP, 2009).

Training area	Category				
	2 NM	9 MP	10 RDNM	13 NU	16 RL
Atomic structure, x-ray production, and interaction of radiation	H	H	M	L	M
Nuclear structure and radioactivity	H	H	M	-	M
Radiological quantities and units	H	H	M	L	M
Physical characteristics of x-ray machines	L	H	H	-	L
Fundamentals of radiation detection	H	H	H	L	M
Principle and process of justification	H	H	H	L	-
Fundamentals of radiobiology, biological effects of radiation	H	H	M	L	M
Risks of cancer and hereditary disease	H	H	H	L	M
Risk of deterministic effects	H	H	H	L	L
General principles of RP including optimisation	H	H	H	M	M
Operational RP	H	H	H	M	H
Particular patient RP aspects	H	H	H	M	-
Particular staff RP aspects	H	H	H	M	H
Typical doses from diagnostic procedures	H	H	H	-	-
Risks from fetal exposure	H	H	H	L	M
Quality control and quality assurance	H	H	H	-	L
National regulations and international standards	M	H	M	L	M
Suggested number of training hours	30–50	150–200	100–140	8–12	20–40

NM – Nuclear Medicine Physicians

MP – Medical Physicists

RDNM – Nuclear Medicine Technologists / Radiographers

NU – Nurses

RL – Radiopharmacists / Radionuclide Laboratory Staff

Levels of Knowledge

L – Low

M – Medium

H - High



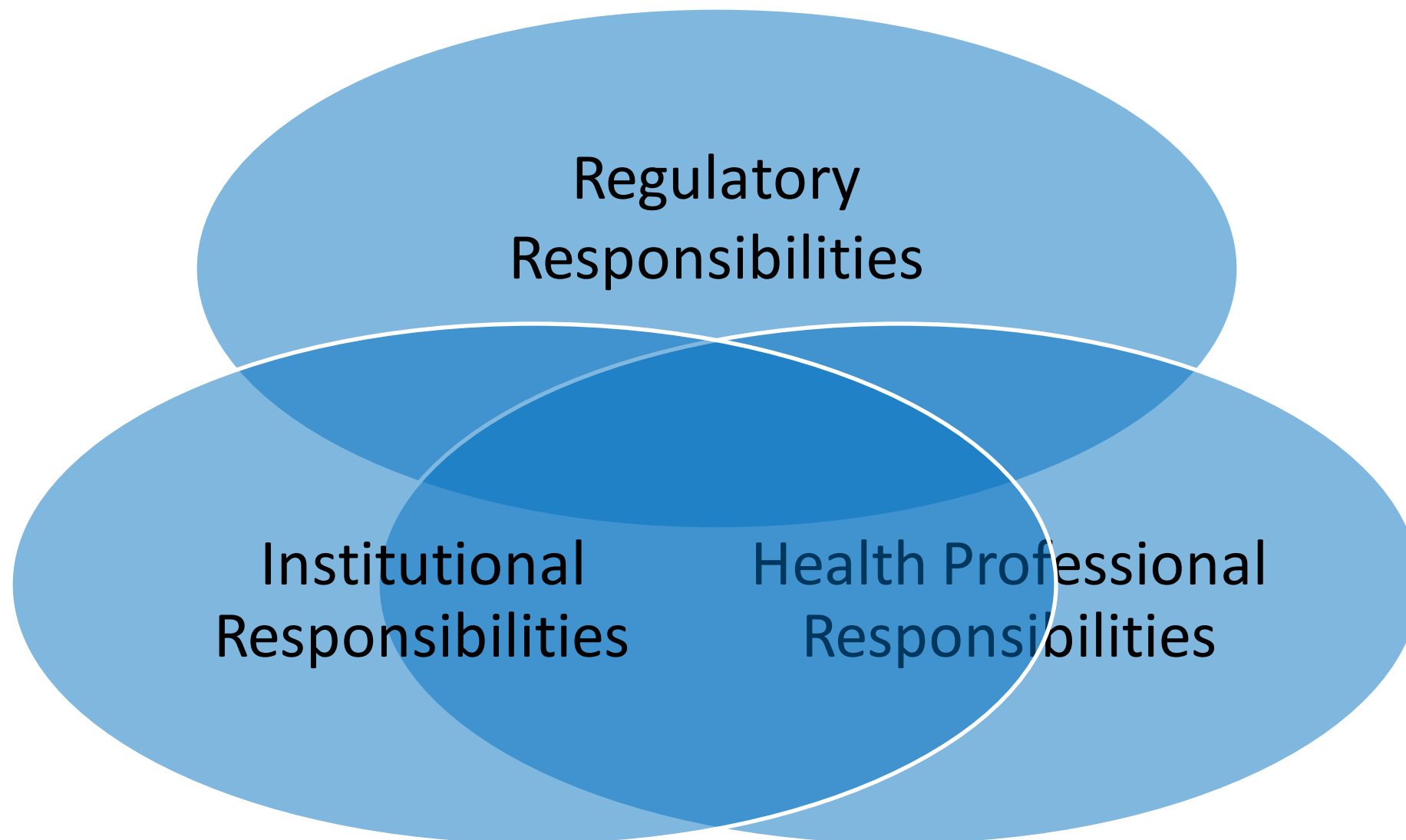
HERCA Guidance
Implementation of Radiation Protection
Expert (RPE) and Radiation Protection
Officer (RPO) Requirements
of Council Directive 2013/59/Euratom

November 2017

This document was approved by the Board of HERCA on 3 November 2017

Available at:

<https://www.herca.org/documents/page/3/>



Regulatory Responsibilities

- The government has to have a **national strategy** and implement a **sound infrastructure** and **legal frame** for RP&S -> **Regulatory Body**:
 - ✓ Educational Requirements & Standards
 - ✓ **Qualification & Updated Certification Requirements**
 - ✓ Provision for support services to guarantee qualified & certified education

Formal recognition and registration of health professionals

- Nuclear Medicine Physicians
- Nuclear Medicine Technologists/Radiographers
- Medical Physicists in the different subspecialities
- Radiation Protection Experts

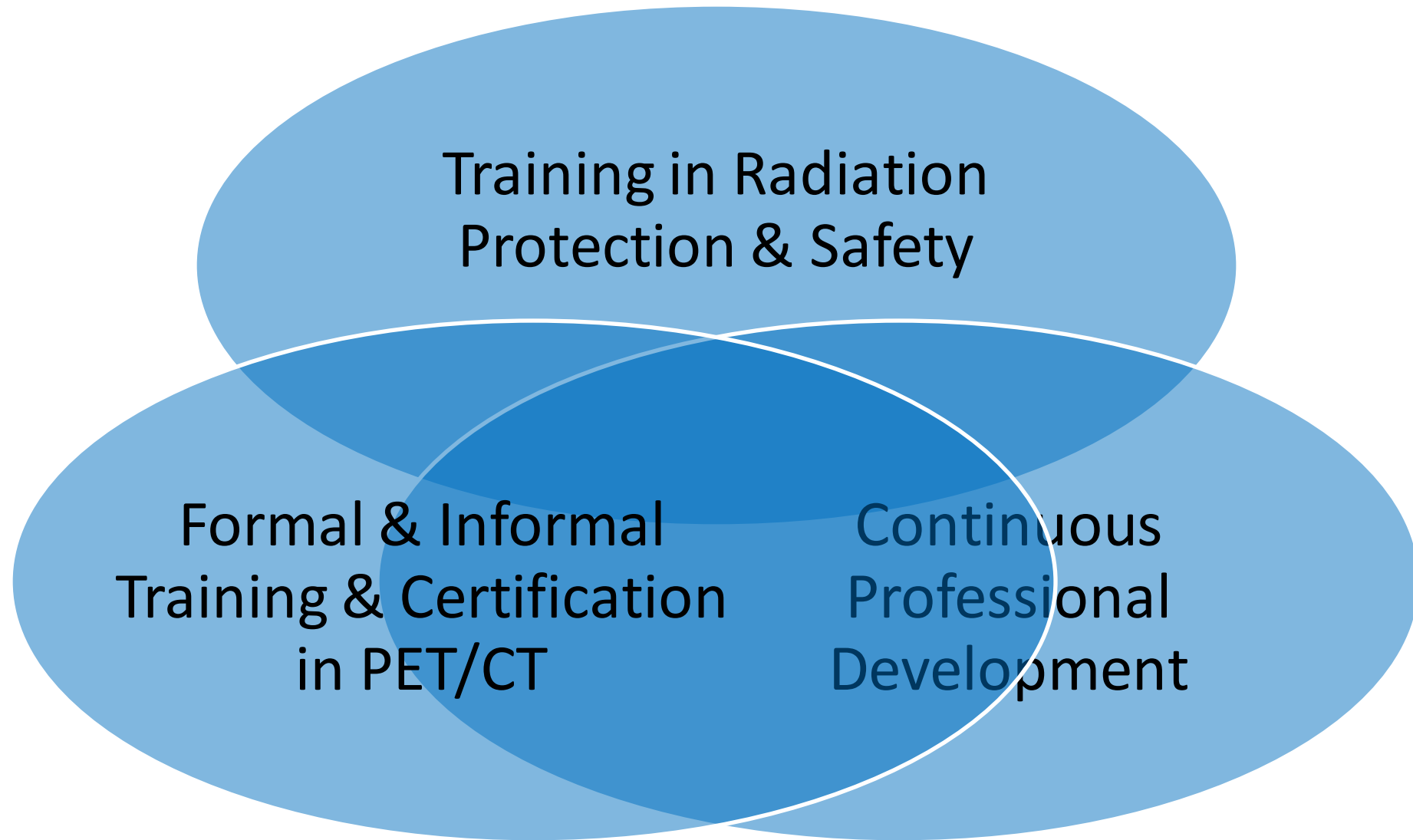
Institutional Responsibilities

- **Guarantee:**
 - ✓ Appropriate education, qualification and certification before employment
 - ✓ A strategy in place for RP&S
 - ✓ Induction programs for all professionals covering RP&S
 - ✓ Dedicated training whenever new technologies are installed
 - ✓ The employee does CPD activities both in medical technologies and RP&S

Inspection Systems established by the government

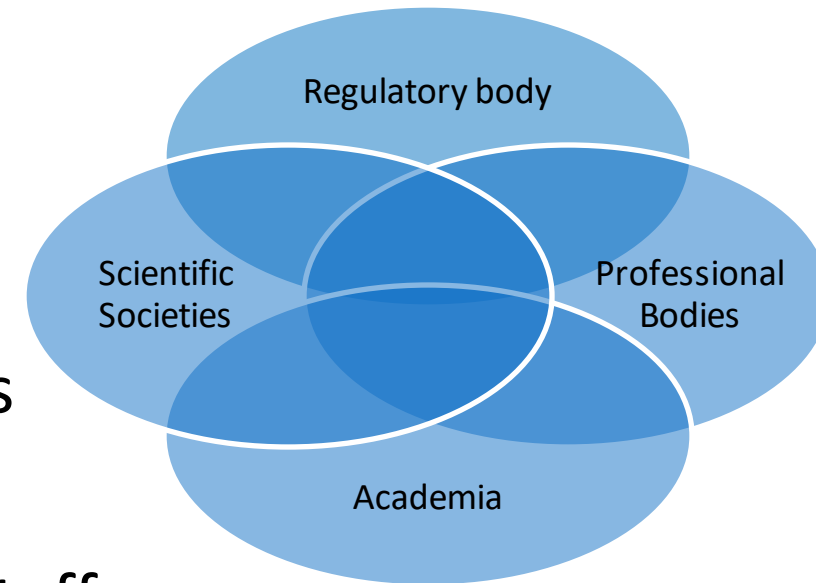
Health Professional Responsibilities

- *“each and every health professional that works with ionising radiation, namely in a PET/CT or PET/MRI facility, has the responsibility to be committed to **keeping themselves updated in their education and training in radiological protection and safety**, as well in the **specific diagnostic modalities with which they work**, in order to guarantee a safe environment for patients, workers and public in general (IAEA, 2018)”.*
- *“They also **have to be available to work with their own organisations and authorities**, in order to contribute to a general culture of radiation safety and constructive uses of ionising radiation”.*



Training in Radiation Protection & Safety

- Nuclear Medicine Physicians
- Medical Physicists
- Nuclear Medicine Technologists/Radiographers
- Nurses
- Radiopharmacists / Radionuclide Laboratory Staff
- Other medical specialists (e.g. radiologists, cardiologists)
- Medical referrers



ICRP Publication 113 (2009)

EC Radiological Protection N. 175 (2014)

Formal Training & Certification in PET/CT

- Nuclear Medicine Physicians
 - ✓ Duly certified and periodically re-certified by National Medical Boards or Colleges, with a syllabus that includes RP&S and PET/CT or PET/MR

(EU) European Board of Nuclear Medicine of the European Union of Medical Specialists | UEMS/EBNM
(USA) ACR-ACNM-SNMMI-SPR practice parameter for performing FDG -PET/CT in oncology

- Nuclear Medicine Technologist/Radiographer
 - ✓ Diploma from a post-secondary education institution
 - +
 - ✓ Mandatory national certification examination and/or Registration at a National Regulatory Body

Formal Training & Certification in PET/CT

- Medical physicist
 - ✓ Formal graduation [in physics, engineering, medical physics or bioengineering] -> residency period (e.g. 3 years program, in Spain) in a hospital -> obtains a certified speciality diploma as Medical Physicist, sometimes with subspecialties (Nuclear Medicine, Radiology and Radiation Oncology).

(EFOMP) European Federation of Organisations for Medical Physics

- ✓ Professional certification and Registry within a National Authority as Medical Physicists + Separate certification as Radiation Protection Experts

(EFOMP) European Federation of Organisations for Medical Physics
EU Council Directive 2013/59/EURATOM
(HERCA) Heads of European Radiological Protection Competent Authorities

Formal & Informal Training & Certification in PET/CT

- Nurses
 - ✓ Most of the training in NM is informal, in the workplace, supervised by professionals with formal training in nuclear medicine
 - ✓ Most National Regulatory Bodies define mandatory the accomplishment of a program in Radiological Protection & Safety
- Radiopharmacists and radionuclide laboratory staff
 - ✓ Some countries have a specific qualification as radiopharmacists (e.g. Residency Program or Postgraduate program at the University)
 - ✓ National Regulatory Bodies define mandatory the accomplishment of a program in Radiological Protection & Safety

ICRP Publication 113 (2009)
EC Radiological Protection N. 175 (2014)

Continuous Professional Development (CPD)

- Mandatory for all health professionals
- Preferably with CPD-certified programs

Available at National and International Societies:

- ✓ European Association of Nuclear Medicine (EANM)
- ✓ Society of Nuclear Medicine and Molecular Imaging (SNMMI)
- ✓ International Society of Radiographers and Radiological Technologists (ISRRT)
- ✓ Institute of Physics and Engineering in Medicine (IPEM)
- ✓ European Federation of Organisations for Medical Physics (EFOMP)
- ✓ European Union Training and Education in Radiation Protection (EU TERP) Foundation

Final Remarks

- To guarantee a safe environment for patients, workers and the public in general, all health professionals who practice PET/CT or PET/MR have to be highly knowledgeable both in the procedures and radiological protection and safety
- Education has to be robust, evidence-based and accredited by authorities in the field.
- Much guidance is available and all stakeholders, at the National and International Levels, should work together to keep in place updated robust educational and certification frameworks

ICRP

www.icrp.org