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European Association of Nuclear Medicine (EANM) – Overview of actions and initiatives in radiation protection, with emphasis on ALARA

Wolfgang Eschner

About EANM (www.eanm.org)

- founded in 1985 in London, HQ situated in Vienna
- umbrella organization of nuclear medicine in Europe
- represents the sector towards European Institutions
- aims at advancing science and education in nuclear medicine for the benefit of public health as well as at
- promoting and coordinating discussion and exchange of ideas and results relating to the diagnosis, treatment, research and prevention of diseases through the use of unsealed radioactive substances ... in medicine
- provide a medium for dissemination and discussion of latest results in the field of nuclear medicine and related subjects

EANM activities

- Annual Congress, attracting an average of > 4,000 participants
- Continuing Medical Education (CME)

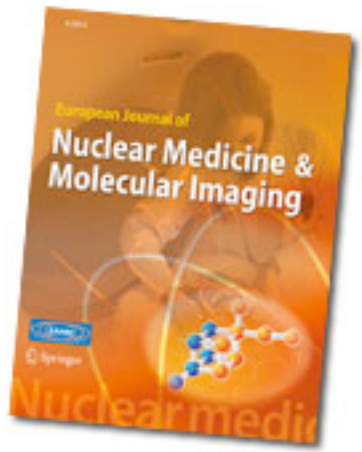
  within the European School of Nuclear Medicine (ESNM):

  | full programme of CMEs at the annual congress,

  | courses at the EANM Educational Facility and

  | seminars in Central & Eastern Europe.
- Scientific Journal

  European Journal of Nuclear Medicine
  and Molecular Imaging (EJNMMI)



- Website, E-Newsletters, Grants, EU/FP7 projects

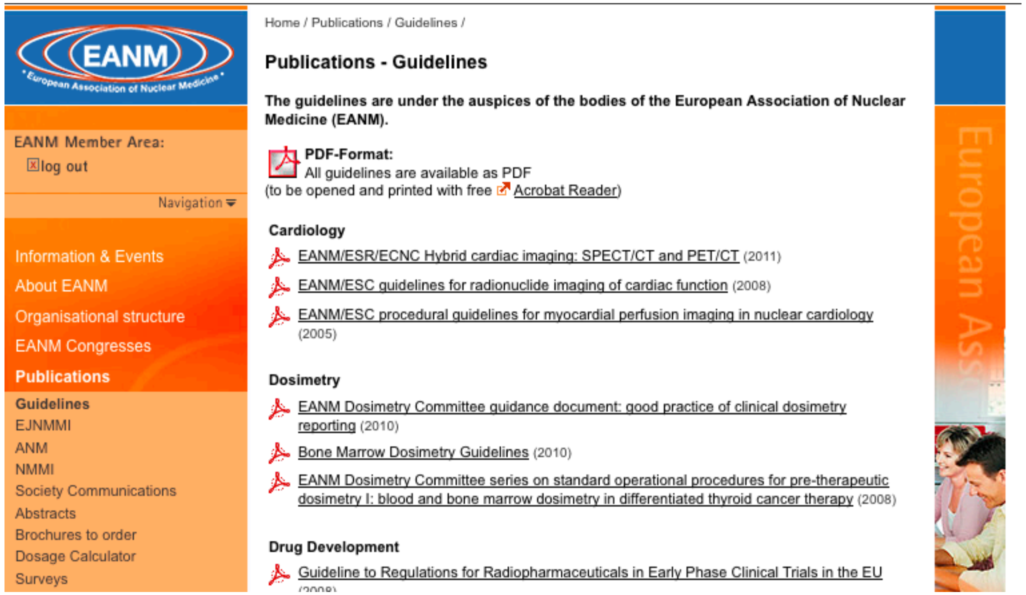
EANM structure – Task groups and committees

- » Cardiovascular Committee
- » Dosimetry Committee
- » Drug Development Committee
- » Neuroimaging Committee
- » Oncology Committee
- » Paediatrics Committee
- » Physics Committee
- » Radionuclide Therapy Committee
- » Radiopharmacy Committee
- » Technologist Committee
- » Translational Molecular Imaging Committee
- » TG Inflammation and Infection

Publications - Guidelines

54 guidelines available online (open access)

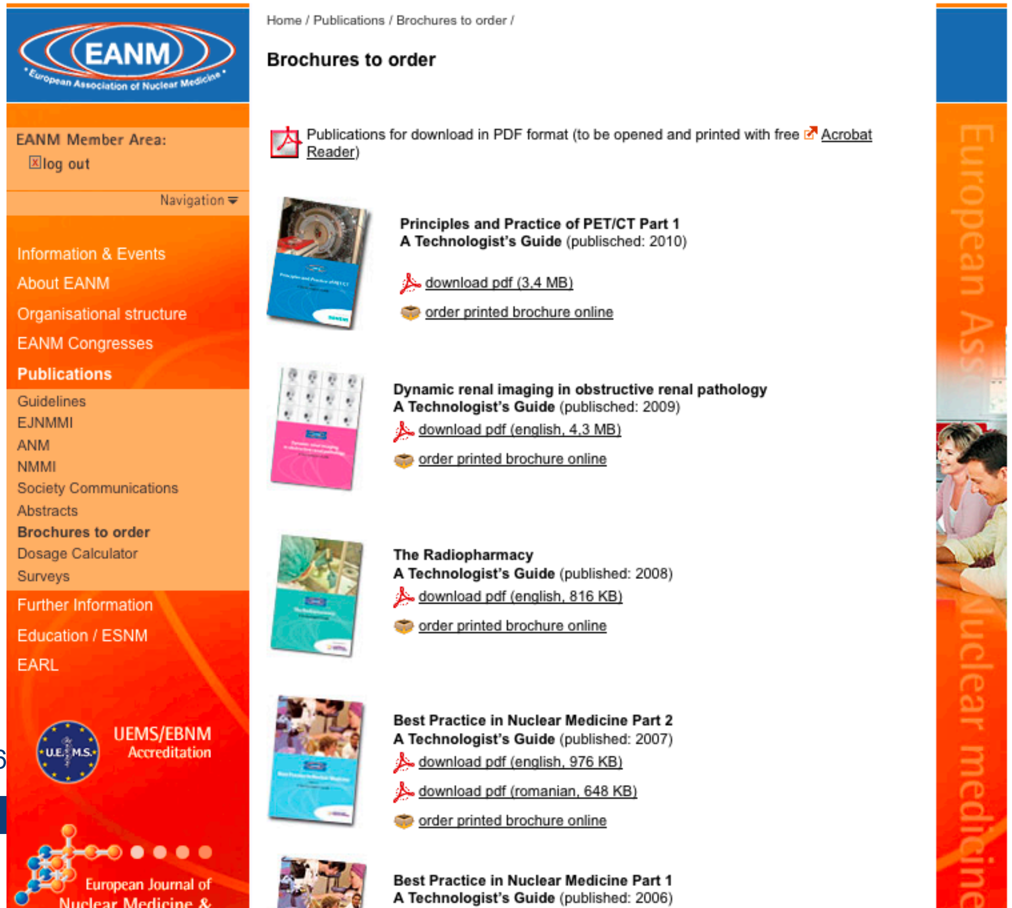
from all areas (dosimetry, physics, pediatric ...), many of them published in EJNMMI



Publications - Brochures

7 brochures available online (open access) and printed

mostly aimed at „Best Practice“; also „Dosage Card“



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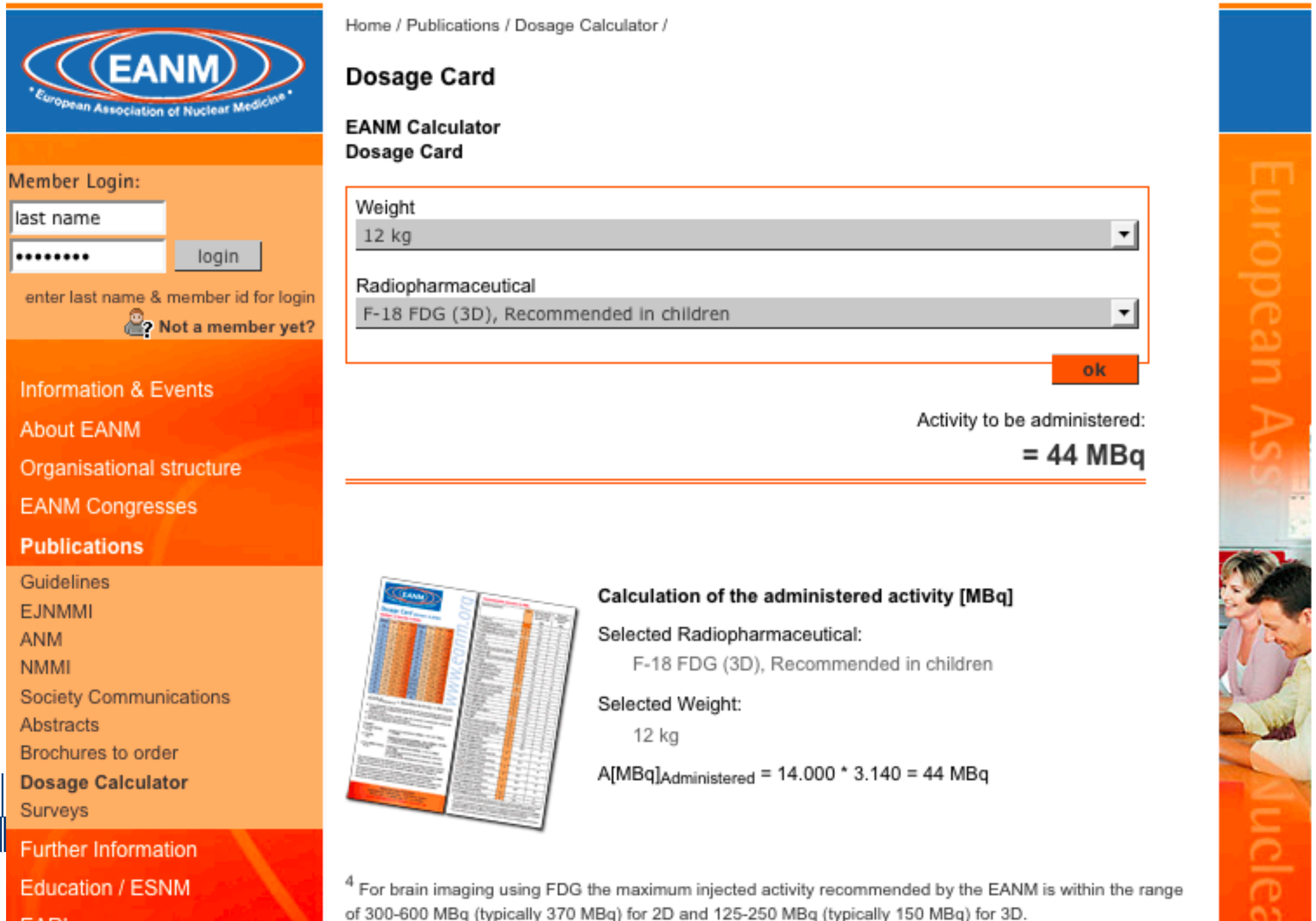
Publications – Dosage Calculator / Dosage Card

online dose calculator; printed version available



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Dosage Card (Version 1.5.2008)

Multiple of Baseline Activity

Weight kg	Class A	Class B	Class C	Weight kg	Class A	Class B	Class C
3	1	1	1	32	3.77	7.29	14.00
4	1.12	1.14	1.33	34	3.88	7.72	15.00
6	1.47	1.71	2.00	36	4.00	8.00	16.00
8	1.71	2.14	3.00	38	4.18	8.43	17.00
10	1.94	2.71	3.67	40	4.29	8.86	18.00
12	2.18	3.14	4.67	42	4.41	9.14	19.00
14	2.35	3.57	5.67	44	4.53	9.57	20.00
16	2.53	4.00	6.33	46	4.65	10.00	21.00
18	2.71	4.43	7.33	48	4.77	10.29	22.00
20	2.88	4.86	8.33	50	4.88	10.71	23.00
22	3.06	5.29	9.33	52-54	5.00	11.29	24.67
24	3.18	5.71	10.00	56-58	5.24	12.00	26.67
26	3.35	6.14	11.00	60-62	5.47	12.71	28.67
28	3.47	6.43	12.00	64-66	5.65	13.43	31.00
30	3.65	6.86	13.00	68	5.77	14.00	32.33

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$$A[MBq]_{\text{Administered}} = BaselineActivity \times Multiple$$

a) For a calculation of the administered activity, the *baseline* activity value has to be multiplied by the multiples given above for the recommended radiopharmaceutical class (see reverse).
b) If the resulting activity is smaller than the minimum recommended activity, the minimum activity should be administered.
c) The national diagnostic reference levels should not be exceeded!

Examples:

a) ^{18}F FDG (WB 3D), 50 kg: activity to be administered [MBq] = 14.0 x10.71 [MBq] ≈ 150 MBq

b) ^{123}ImIBG, 3 kg: activity to be administered [MBq] = 28.0 x1 [MBq] = 28 MBq < 80 MBq (Minimum Recommended Activity)
=> **activity to be administered: 80 MBq**

c) ^{99m}Tc HMPAO (Brain), 58 kg: activity to be administered [MBq] = 51.8 x12 [MBq] ≈ 621 MBq
This would e.g. exceed the German diagnostic reference level of 550 MBq
=> **activity to be administered in Germany: 550 MBq**

This card is based upon the publication by Jacobs F, Thierens H, Piepsz A, Bacher K, Van de Wiele C, Ham H, Dierckx RA. Optimized tracer-dependent dosage cards to obtain weight-independent effective doses. Eur J Nucl Med Mol Imaging. 2005 May; 32(5):581-8.

This card summarizes the views of the Paediatric and Dosimetry Committees of the EANM and reflects recommendations for which the EANM cannot be held responsible.

Recommended Amounts in MBq

Radiopharmaceutical	Class	Baseline Activity (for calculation purposes only) MBq	Minimum Recommended Activity[1] MBq
^{123}I (Thyroid)	C	0.6	3
^{123}I Amphetamine (Brain)	B	13.0	18
^{123}I HIPPURAN (Abnormal renal function)	B	5.3	10
^{123}I HIPPURAN (Normal renal function)	A	12.8	10
^{123}I mIBG	B	28.0	80
^{131}I mIBG	B	5.6	35
^{18}F FDG (2D)[4]	B	25.9	26
^{18}F FDG (3D), Recommended in children[4]	B	14.0	14
^{18}F Fluorine (2D)	B	25.9	26
^{18}F Fluorine (3D), Recommended in children	B	14.0	14
^{67}Ga Citrate	B	5.6	10
^{99m}Tc ALBUMIN (Cardiac)	B	56.0	80
^{99m}Tc COLLOID (Gastric Reflux)	B	2.8	10
^{99m}Tc COLLOID (Liver/Spleen)	B	5.6	15
^{99m}Tc COLLOID (Marrow)	B	21.0	20
^{99m}Tc DMSA	A	17.0	15
^{99m}Tc DTPA (Abnormal renal function)	B	14.0	20
^{99m}Tc DTPA (Normal renal function)	A	34.0	20
^{99m}Tc ECD (Brain perfusion)	B	32.0	110
^{99m}Tc HMPAO (Brain)	B	51.8	100
^{99m}Tc HMPAO (WBC)	B	35.0	40
^{99m}Tc IDA (Biliary)	B	10.5	20
^{99m}Tc MAA / Microspheres	B	5.6	10
^{99m}Tc MAG3	A	11.9	15
^{99m}Tc MDP	B	35.0	40
^{99m}Tc Pertechnetate (Cystography)	B	1.4	20
^{99m}Tc Pertechnetate (Ectopic Gastric Mucosa)	B	10.5	20
^{99m}Tc Pertechnetate (Cardiac First Pass)	B	35.0	80
^{99m}Tc Pertechnetate (Thyroid)	B	5.6	10
^{99m}Tc RBC (Blood Pool)	B	56.0	80
^{99m}Tc SestaMIBI/Tetrofosmin (Cancer seeking agent)	B	63.0	80
^{99m}Tc SestaMIBI/Tetrofosmin[2] (Cardiac rest scan 2-day protocol min)	B	42.0	80

CME Sessions at EANM congress 2010

CME Topics:

- CME I – Cardiovascular – October 10, 08:00-09:30
  Practical Aspects of PET Imaging in Patients with Ischemic Heart Disease

- CME II – Physics – October 10, 11:30–13:00
  Radiation Exposure in Nuclear Medicine and Multimodality Imaging

...

most lectures available online

COURSES 2011

EANM
European Association of Nuclear Medicine

CME at the Educational Facility

FEBRUARY 05–06
EANM/ESTRO Educational Seminar on PET in Radiation Oncology
In Brussels

FEBRUARY 19–20
Cardiovascular Course

MARCH 10–12
Course on PET/CT in Oncology, basic

MARCH 19–20
Technologist PET/CT Course, basic

MAY 05–07
Course on PET/CT in Oncology, advanced

MAY 14–15
Neuroimaging Course

MAY 21–22
Technologist PET/CT Course, advanced

SEPTEMBER 01–03
Course on PET/CT in Oncology, basic

SEPTEMBER 10–11
Technologist PET/CT Course, basic

SEPTEMBER 17–18
Cardiovascular Course
In German

SEPTEMBER 22–23
Dosimetry Course, advanced

NOVEMBER 05–06
Paediatric Course

NOVEMBER 19–20
EANM/ESTRO Educational Seminar on PET in Radiation Oncology

NOVEMBER 26–27
Technologist PET/CT Course, advanced

radiation protection topics covered in each course

www.eanm.org

ALARA topics in nuclear medicine

Protection of workers

- No urgent topics, level of awareness high
- incorporation risk generally low
- external exposure from beta emitters: technical (see session 3)
- cataract induction?

Protection of the public

- public exposure (e.g. to excreted iodine-131) not being discussed from ALARA point of view

ALARA topics in nuclear medicine

Protection of patients

– **focus on children and adolescents**
– muldimodality imaging: PET-CT, SPECT-CT
– (harmonization of) diagnostic reference levels
– critical review of dosimetric data for licensed / used / investigated radiopharmaceuticals
– reappraisal of the „R“ in ALARA: investigate **risk**
  - Epidemiological risk analysis, e.g. thyroid cancer caused by radioiodine treatment
  - Prognosis-based lifetime attributable risk approximation (PROLARA)

Home

SEVENTH FRAMEWORK PROGRAMME

Introduction

Welcome to the website of the project **PEDDOSE.NET**:
Dosimetry and Health Effects of Diagnostic Applications of Radiopharmaceuticals with particular emphasis on the use in children and adolescents.

Nuclear medicine contributes significantly to the health, healthcare and quality of life of European citizens, particularly in major clinical areas such as cancer and cardiovascular disease. Every year, over 6 million patients benefit from a nuclear medicine procedure in Europe, 95% of which are diagnostic and 5% therapeutic. The evaluation of the impact on patients' health of small and non-repetitive or less repetitive doses of radioactive substances, as currently used in diagnostic imaging procedures, has up to now not been addressed systematically in a European context. This is where the project Peddose.net steps in.

This Support Action started in April 2010 and is partially funded by the European Commission under the FP 7 call: *HEALTH-2009-1.2-6: Evaluation of the potential health impact of diagnostic imaging agents doses.*

(WP1) review of frequently used radiopharmaceuticals

In many biokinetic and dosimetric studies the number of subjects included is < 10. In the scope of the new ICRP recommendations (ICRP 103) also gender-specific differences might need to be considered in the future.

Dosimetric raw data (residence times, %ID) not compatible with ICRP 103 organ weighting factors.

The quality of the experimental data as a base for assessments of the absorbed dose is highly variable.

For some more frequently used PET-pharmaceuticals such as F-18-fluoride or Ga-68-DOTATATE no published data on dosimetry are available.

For some substances such as Tl-201-chloride recalculations of the absorbed doses in ICRP 106 lead to a substantial decreased effective dose (14 mSv vs. 20 mSv) due to a re-evaluation of the available data on testes uptake.

For I-131-iodide used for pre-treatment dose estimates in differentiated thyroid cancer patients the absorbed doses given by ICRP reports need to be modified e.g. because of medication-related changes in the patients' biokinetics.

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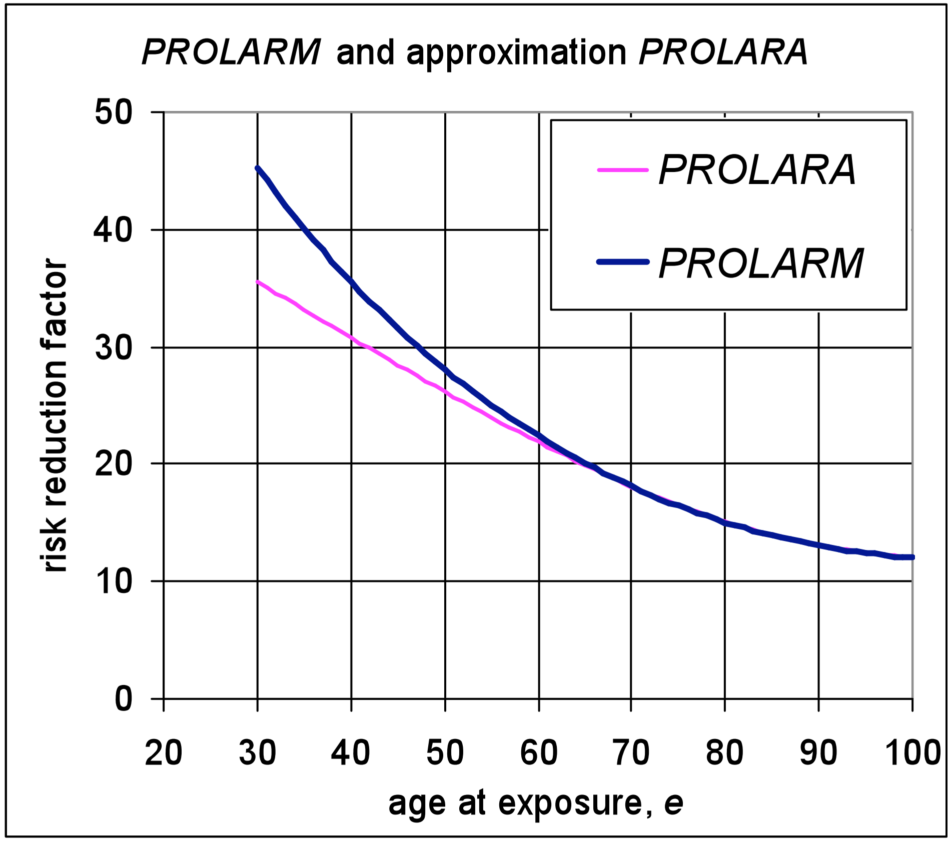
(WP1) Report on Epidemiologic Data

„R reappraisal“

Standard risk calculations applied to a group of n=4285 patients with metastatic breast cancer

- An effective dose of 10 mSv at age e=50 years yields LAR values of 1.2×10^{-3} for nonpatients and 4.3×10^{-5} for a patient in the above cohort.
- That is a reduction in risk by a factor of 29 (PROLARM). From an approximation using only survival data, that ratio is 27 (PROLARA).



Eschner W et al. Eur J Nucl Med Mol Imag 2010, 37, 131.

2011.04.28 — PEDDOSE.NET Final Workshop

SAVE THE DATE!

PEDDOSE.NET Final Workshop: Peddose.net - Do we apply too much radiation in diagnostic nuclear medicine?

15 October 2011, 9:30 - 12:30 hrs
Part of a pre-congress dosimetry symposium to the 2011 EANM congress in Birmingham

Venue:
The ICC & the NIA Birmingham
Broad Street
Birmingham, B1 2EA, United Kingdom

MEDRAPET

Medical Radiation Protection
EDUCATION AND TRAINING

CONTACT

ABOUT
- BACKGROUND
- OBJECTIVE
- PROJECT ORGANISATION
- CONSORTIUM

NEWS
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PARTNERS' AREA

ABOUT

The main aim of the MEDRAPET project is the identification of needs in radiation protection training. An integrated approach to education and training with high-standard training programmes harmonised at EU level is a key prerequisite to ensure excellence in radiation protection and to implement programmes for dose optimization in medicine.

It is essential that all stakeholders in radiation protection ensure that proper education and training are in place, in particular with regard to new technologies and complex medical exposure procedures that have been developed in the past years and that are introduced into clinical practice at a rapid pace.

The results of the MEDRAPET project will be the basis for the revision of the Radiation Protection 116 Guidelines on Education and Training in Radiation Protection for Medical Exposures.

MEDRAPET is financially supported by the European Commission.

Thank you!