EFRS EUROPEAN FEDERATION OF RADIOGRAPHER SOCIETIES

Multi-stakeholder meeting on the optimised use of CT scanners

"The Process of CT dose optimisation through education and training and role of CT Manufacturers"

Dean Pekarovič

EFRS - CT Expert Group

HERCA Heads of the European Radiological protection Competent Authorities

EFRS in Numbers

Now in 2015

- 35 radiographer societies from 32 countries

- 46 educational institutions from 25 countries

  EFRS educational wing, called "HENRE" (Higher Education Network for Radiography in Europe)

Over 100.000 Radiographers
\+ 8.000 Radiography students

Radiographers are medical imaging and radiotherapy experts who :

- are professionally accountable to the patients' physical and psychosocial well being, prior to, during and following examinations or therapy
- take an active role in justification and optimisation of medical imaging and radio therapeutic procedures
- are key-persons in radiation safety of patients and third persons in accordance with the "As Low As Reasonably Achievable (ALARA)" principle and relevant legislation

Radiographer position in RP Chain

Referral

Referring doctor

Approval

Radiologist

Exposure

Radiographer → IMAGE & DOSE

Reporting

Radiologist→ Diagnosis

Justification

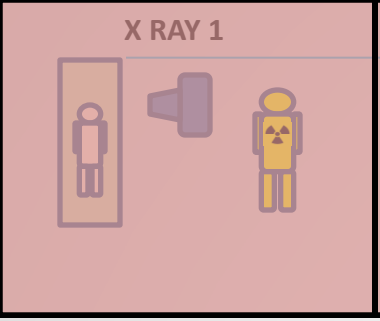
Optimization

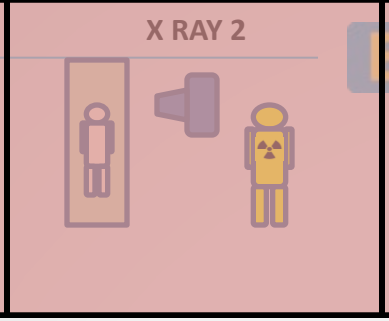
Optimization

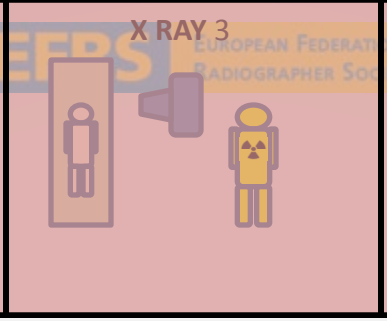
Balance

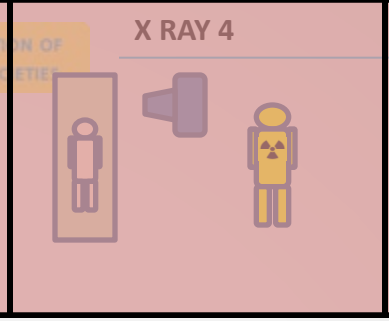
ImQ ⟷ Dose

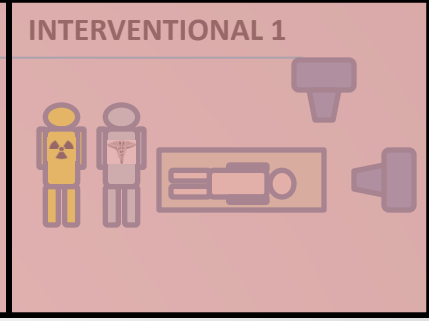
Radiologist ⟷ Physicist



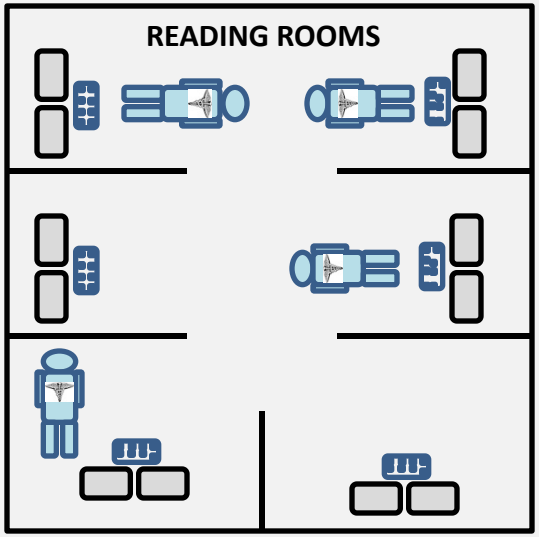


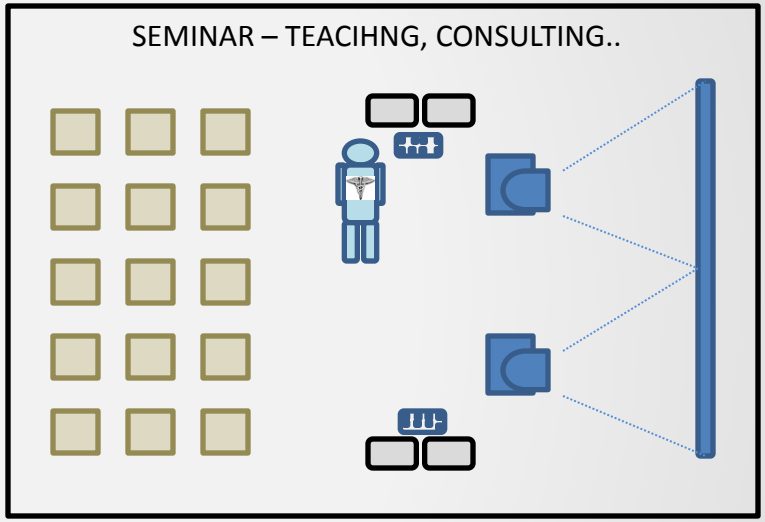


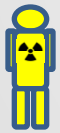




ADMINISTRATION

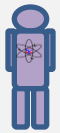




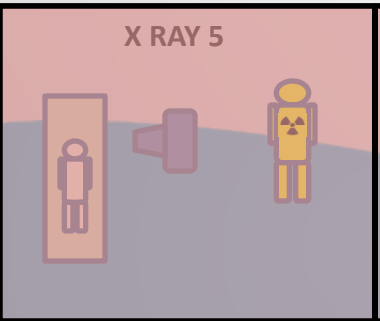


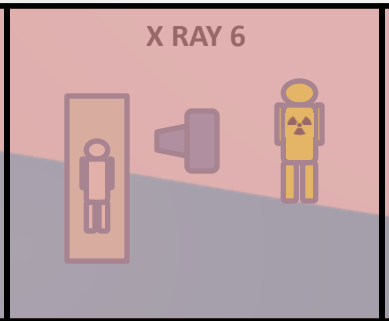
RADIOGRPAHER

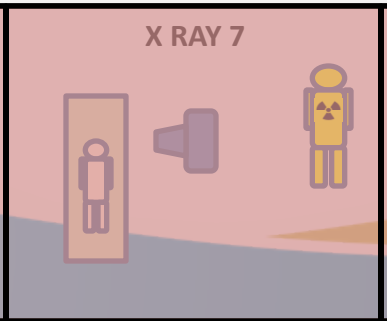
RADIOLOGIST

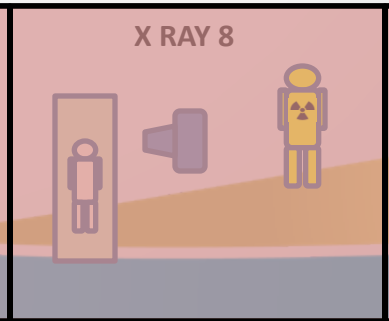


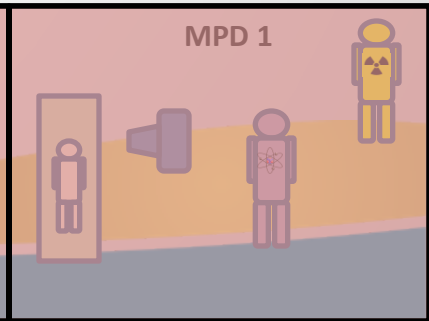
MEDICAL PHYISICIST











Do we have problems ?

Many studies shows difference in :

- ImQ
- DRL (only few countires published)

- Number of CT procedures is increasing
- Number of CT modalites

- Level of basic training (vendors)
- Appropriate time for adopting new CT

- How to reach all professions ?
- Need to cooperate !
- Competences ?!

- Clear responsabilites !

Meeting point

Radiologist
Medical Physicist
Radiographer

} Experience

- Training Material
- Guidelines
- Available articles, researches, how to do it ..
- QA (easy and repeatable protocols)

EMAN - 2012

WP 4 : CT Dose Reduction Techniques: Scan Protocols

"Each CT facility should identify a "core team" including a radiographer, a radiologist and a medical physicist and being responsible for optimisation of CT protocols. This "core team" is also responsible for ensuring training of CT radiographers and supervision of utilization of scanning protocols."

EMAN - 2012

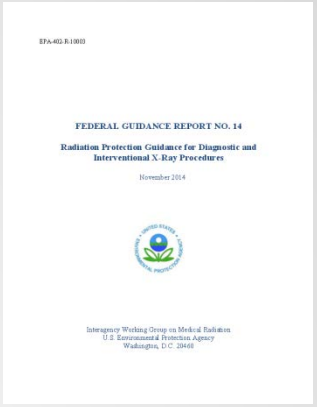
WP 8 :Training & Education

1. The medical practitioners requesting a CT examination. This group requires knowledge about indications for CT and benefits.
2. The core CT team that defines and optimizes the set of standard scan protocols on a specific scanner (radiographer, medical physicist and radiologist).This team will usually start with a standard set of protocols provided by the manufacturer and adapt it to the local needs. This team requires in-depth knowledge of scan parameters and how to optimize them.
3. The professionals (radiologists, radiographers) define the CT protocols. This group has to have knowledge when not to use CT, but another image technique, according to patient clinical indication. They are ultimately responsible for the individual choice of the correct protocol associated with each of the set of available standard protocols at a specific scanner / institution.
4. The radiographers that actually perform the examination. This group requires knowledge about individual routin such as centring of patients, adap size, optimizing modality performance in order to obtain the best diagnostic image at the lowest possible dose.

1. and 3. - Justification

2. and 4. - Optimisation

Radiation Protection Guidance for Diagnostic and Interventional X-Ray Procedures EPA , Nov. 2014



Medical Radiologic Technologists **(= Radiographers)**

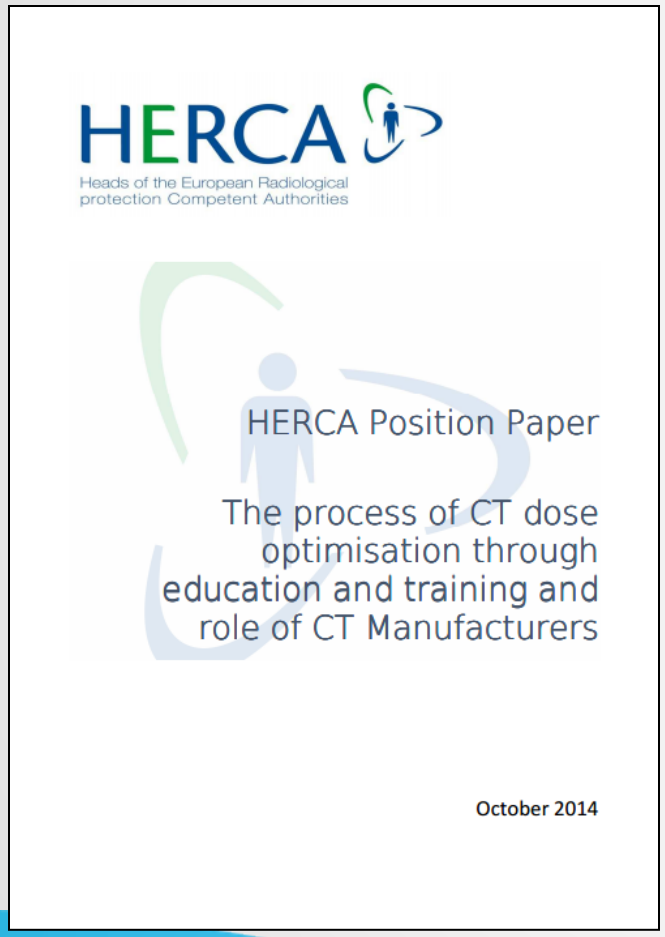
Medical Radiologic Technologists (MRT) and Registered Cardiovascular Invasive Specialists (RCIS) having appropriate radiation and other training are the personnel who operate the imaging equipment, deliver the radiation to the patients, and capture the diagnostic images.

As such, they are extremely important in the optimized use of diagnostic imaging.

Personnel

CT systems should only be operated by Radiologic Technologists(= Radiographer)registered by the ARRT or equivalent, preferably with advanced certification in CT, operating under the supervision of Radiological Medical Practitioners with appropriate training in CT physics, radiation safety and CT image interpretation.

HERCA Position Paper



EFRS appreciates and supports the key role HERCA has in steering this initiative and facilitating its implementation for the benefit of reducing radiation exposure in relation to CT examinations.

EFRS's Recommendations for the Improvement of the CT Position Paper

- For the purpose of maintaining standardised benchmarks and documents that can be equally used globally, we ask for the replacement of the term ***CT technologists*** with the generic term ***Radiographers*** throughout the document in line with the EFRS definition of a radiographer.

Comments -Ad.1 to provide your professional body's feedback on the HERCA position paper

Section 1 mentions the provision of specific training curricula.

- Should be more orientated to specific groups.
- Wher CT is – radiographers is.

Radiographers have an important responsibility to understand all parameters affecting dose and how to maintain and provide the desired images, with diagnostic quality level, for adequate reporting.

- The curricula should be adopted to meet the needs of the focus group e.g. radiographers, radiologists.

Radiographers Training Curriculum

- CT Technology
- Description of all settings, parameters
- Optimisation procedures of vendor protocols on a patient selective basis
- Dose considerations for different patient size in particular for pediatric patients
- Image Quality and techniques to be used for different clinical indications
- Steps on how to adopt to different noise textures
- CT dose quantities
- Relevance of CT DRL's
- Warning and Reference levels in CT
- CT dose metrics and patient dose estimation
- Quality Assurance
- Radiation safety issues

3. The identification of the Stakeholders involved in CT dose optimisation

Radiologists and other imaging specialists are responsible for the:

- Justification of the CT examination
- Dose optimisation of the CT examination
- Image quality of the CT examination

- Radiographers are not given responsibility for image quality - despite the fact that a primary role of CT radiographers is to produce diagnostic quality images using the lowest possible dose.

Responsibilities of Radiographers do not end with the optimisation of CT protocols.
MEDRAPET

MEDRAPET, RP 175

Guidelines on radiation protection education and training of medical professionals in the European Union

Table 6.1: Core learning outcomes in radiation protection for radiographers

	Knowledge (facts, principles, theories, practices)	Skills (cognitive and practical)	Competence (responsibility and autonomy)
Core Learning outcomes in radiation protection	K1. Explain physical principles of radiation generation, interaction, modification and protection K2. Explain radiation physics, radiation hazards, radiation biology and dosimetry K3. Understand risk: benefit philosophy and principles involved in all aspects of radiography K4. Identify current national and international radiation protection legislation and regulations relating to staff, patients, carers and the wider general public K5. Explain the physics underpinning non-ionising imaging techniques, including magnetic resonance imaging and ultrasound along with associated safety considerations K6. Describe professional roles and responsibilities in terms of aspects of justification and optimisation K7. Explain QA and QC practices to include: legislation, regulations and guidelines, test equipment and methodologies, programme design and implementation and reporting to ensure the provision of an effective, safe and efficient service K8. Understand occupational risks to health and safety that may be encountered such as safe moving and handling of patients and equipment K9. Describe the importance of audit, research and evidence-based practice to include: the stages in the research process, research governance, ethics, statistics and statistical analysis to facilitate a deeper understanding of research findings and clinical audit K10. Identify the different determinants of radiation risk perception; know the pit-falls of communication on radiation risks	S1. Use the appropriate medical devices in an effective, safe and efficient manner S2. Use effective, safe and efficient radiation protection methods in relation to staff, patients and the general public applying current safety standards, legislation, guidelines and regulations S3. Critically review the justification of a given procedure and verify it in the light of appropriateness guidelines and when in doubt consult the responsible specialist S4. Use and undertake clinical audits S5. Identify the principles of evidence-based practice and the research process S6. Critically reflect on and evaluate one's own experience and practice S7. Participate in CPD S8. Recognise the complicated situation pertaining to radiation protection regarding scientific knowledge on the one side and societal concern and personal emotions on the other side S9. Identify different image quality standards for different techniques S10. Apply the concepts and tools for radiation protection optimisation	C1. Practise effectively, accurately and safely and within the guidance of legal, ethical and professional frameworks C2. Use the appropriate and correct form of identification, address and treatment of the patient (and any accompanying carer if appropriate) C3. Avoid unnecessary exposure and minimise necessary exposure as part of optimisation C4. Seek consent for any examination/treatment to proceed C5. Carry out work in a safe manner when using ionising radiation, taking into account current safety standards, guidelines and regulations C6. Participate in the process of creating and guaranteeing maximum safety for the patient, oneself and others during examinations /treatments involving ionising radiation and maintain the ALARA principle C7. Refuse to accept or carry out a request or referral which, in one's professional opinion, is dangerous or inadvisable C8. Recognise the limitations to one's own scope of competence and seek advice and guidance accordingly C9. When taking decisions about care for (individual) patients be able to make use of relevant national and international (scientific) insights, theories, concepts and research results and integrate these approaches into one's own professional actions (evidence-based practice)

MEDRAPET, RP 175

Guidelines on radiation protection education and training of medical professionals in the European Union

Table 6.1.1: Additional learning outcomes in radiation protection for radiology radiographers

	Knowledge (facts, principles, theories, practices)	Skills (cognitive and practical)	Competence (responsibility and autonomy)
Additional for radiology	K1. Explain the relationship of exposure factors to patient exposure K2. Understand how patient position affects image quality and dose to radiosensitive organs K3. Understand the effect of filter type in diagnostic X-ray systems K4. Understand the purpose and importance of patient shielding K5. Understand post-processing possibilities for CR and DR systems (filters, noise, magnification, raw data manipulation) K6. Know recommendations and legal requirements applying to medical, occupational, and public exposure	S1. Perform the medical procedure with the appropriate X-ray equipment suited and optimised for the specific medical procedure (adult, paediatric, projection possibilities, adjustments for longer procedure time, etc.) S2. Operate according to Good Medical Practice in order to minimise overall fluoroscopy time S3. Put into practice the basic principles of preventing (unnecessary) exposure (time, distance, shielding) S4. Programme the use of beam filters in mammography and conventional radiography (proper use of additional filtration) S5. Use and record the integrated dose meter (DAP) and checks the measured values against DRLs and/or threshold doses for deterministic effects in order to prevent deleterious effects on patients whenever possible S6. Identify various types of patient shielding and state the advantages and disadvantages of each type S7. Use the appropriate method of shielding for a given radiographic procedure S8. Identify difference between continuous and pulsed fluoroscopy and use each mode when appropriate S9. Explain and communicate effectively the nature and magnitude of radiation risk and benefits, in order to obtain informed consent	C1. Take responsibility for use of proper exposition parameters according to type of modality and to radiological procedure C2. Identify the appropriate image receptor that will result in an optimum diagnostic image with the minimum radiation exposure to the patient C3. Identify proper C-arm position regarding occupational doses C4. Discuss added and inherent filtration in terms of the effect on patient exposure C5. Compare dose measurements (DAP, DLP, KAP, ESD, CTDI, glandular dose) readings or equivalent to National or European DRLs C6. Participate in the optimisation of all parameters to create protocols regarding to National or European DRL. C7. Optimise radiological procedure to fit pregnant women and use appropriate paediatric protocols C8. Take responsibility for choosing post-processing tools and change exposure parameters to obtain lower dose for clinical diagnostic images C9. Advise on the proper use of personal protection. C10. Optimise the use of radiology equipment according to ALARA principles

3. The identification of the Stakeholders involved in CT dose optimisation

diagnostic quality of the CT images that they require, in order to carry out their diagnosis[10]. They need to indicate to the CT technologist which clinical protocol needs to be used according to the clinical diagnoses requested in order to give the patient a dose as low as achievable while obtaining at the same time the required image quality.

- Radiologist and Radiographer should make a decision together about which protocol should be used.
- In routine work (for basic clinical indications) this is not really an issue.
- However, when the diagnostic problem is much more complex, then knowledge of both participants becomes crucial.

4.2. Dose management tools

- EFRS recommends that the exported data reveal the names of both the Radiologist and Radiographer.
- More responsable after analyisis.

Newly developed dose optimisation tools by the manufacturer should be made **freely available** and its utilisation should be encouraged at the site, to benefit from them and to minimise patient dose.

The concluding line of "*patient dose reduction while maintaining adequate image quality can only be achieved if these features are available to the CT user and only if the CT user knows how to use these*" reinforces this recommendation.

CPD - Continuing Professional Development

The HERCA document stresses the need for dedicated education.

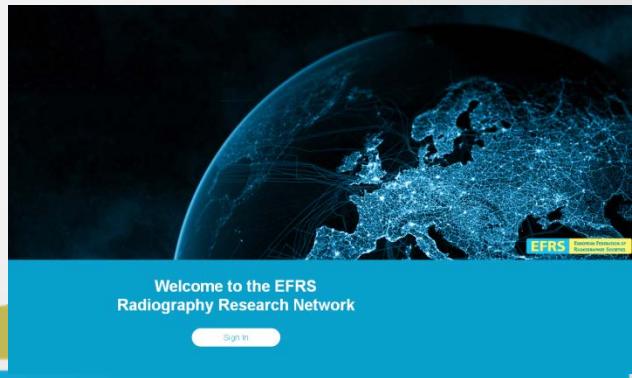
- It does not mention CPD and the need for all medical imaging professionals to constantly update their knowledge in the area of CT dose reduction/optimisation.
- Therefore EFRS recommends that the CT Position Paper should emphasize the importance of radiologists, radiographers and physicists engaging in regular (annual) CPD activities to maintain their knowledge, in particular given the speed of change of technology in CT.

EFRS actions

- EFRS promotes the Knowledge, Skills and Competence table developed in MEDRAPET to be included in the curricula of Radiographer education across Europe.
- EFRS is active in promoting the outcomes of **EMAN**, **MEDRAPET.**
- EFRS is active in **PiDRL** and the **EUROSAFE** campaign.
- EFRS facilitates the organisation of CT dose management radiographer workshops in Eastern Europe.
- EFRS will serve as point of contact to disseminate learning material through our full and affiliated member organisations.

EFRS future actions

- Establish an **EFRS Radiographer Research Network** (www.efrs-rrn.eu) group that focuses on CT dose reduction/optimisation and patient safety.
- Establish an ongoing working relationship with COCIR
- Start communication with Industry to provide/propose protocols for different age groups and different indications
- Promote and increase the visibility of radiographers and their key role in providing a radiation safe environment and CT dose reduction.
- Teamwork and collaboration with European and World wide key stakeholder organisations.
- Develop an image databank of CT images of high quality.
- Promotion of dedicated CPD training.



EFRS - Commitments

- Cooperate with HERCA to promote and disseminate joint documents.
- Cooperate with Industry in establishing dedicated training curricula for radiographers.
- Promote documents and education material on the EFRS web site and within the EFRS networks.
- Promote the implementation of EQF level 6 (Bachelor) in respect to the education of radiographers across Europe.
- Support workshops and trainings together with the Industry to share knowledge and also to provide feedback for the Industry on issues of CT dose reduction and optimisation.

EFRS

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Thank you

www.efrs.eu
info@efrs.eu

Dean Pekarovič
Clinical Institute of Radiology
University Medical Centre Ljubljana