HERCA Multi-stakeholder meeting on the optimised use of CT scanners

ESR Feedback on the HERCA position paper and the proposal of possible commitments

Guy Frija, European Society of Radiology

1. Introduction

- Over the last decade, tremendous developments in CT technology have taken place. The growing use of this technology is of great benefit to individual patients and to society as a whole.

- However, any increase in medical radiation exposure must be considered from a radiation protection perspective, particularly if the exposures are not justified and optimised properly.

The COCIR actions include

- The development and implementation of a standardised benchmarking of CT systems by characterising the dose efficiency related to image quality
- The implementation of dose reduction measures in CT
- The implementation of dose management and reporting tools
- The provision of specific training curricula

2. The legislators' point of view

- The Council Directive 2013/59/Euratom8 states in article 56 on optimisation that "Member states shall ensure that all doses due to medical exposure for radiodiagnostic, interventional radiology, planning, guiding and verification purposes are kept **as low as reasonably achievable** consistent with obtaining the required medical information..."
- On responsibilities, it is stated that "**the practitioner, the medical physicist and those entitled to carry out** practical aspects of medical exposures are involved, as specified by Member States, in the optimisation process" and article 58 requires Member States ensure that "clinical audits are carried out in accordance with national procedures ".
- **Clinical audit** is an essential tool in developing and demonstrating dose optimisation.

ESR COMMENTS

- Importance of justification
- Importance of the concept of team
- Importance of clinical audit

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

CT dose optimisation through the use of dose reduction and dose management tools can only be made possible if radiologists and other imaging specialists, medical physicists, CT technologists and CT manufacturers work together **as a team**

4. The identification of Dose optimisation tools

4.1. Dose reduction tools

A great number of dose reduction features are now available on modern CT scanners. The most important ones being…….

4.1. Dose reduction tools

- Predefined protocols for adults and children
- Dose modulation options
- A variety of iterative reconstruction software algorithms

"…A number of publications have shown that by using these tools the mean DLP per CT examination can be reduced by between 20 and 70 %...."

Draft version 2.5 IAEA SAFETY STANDARDS

- Radiation Protection and Safety in Medical Uses of Ionizing Radiation
- Step 8. For Member States' review and comments
- DRAFT SAFETY GUIDE DS399

ESR POSITION

- "…. a given piece of equipment should include as a default all the relevant protective tools and the features that provide the greatest control over patient radiation protection."
- "….Paring the price back by removing radiation protection and safety options in order to gain a sale is not acceptable. "
- "….Facility management should not be placed in a position of saving money at the expense of compromising radiation safety."

REGULATOR SUPPORT

4. The identification of Dose optimisation tools

4.2. Dose management tools

- All COCIR CT manufacturers provide a display of dose metrics and export capability, allowing software programs to produce dose statistics for a scanner or a collection of scanners at a site.

FROM IAEA DRAFT SAFETY STANDARDS

- 2.144. Digital information systems are becoming increasingly available to provide various support functions to the management system of the medical radiation facility, including handling requests for radiological procedures, scheduling radiological procedures, tracking patients, and the processing, storage, and transmission of information pertaining to the patient

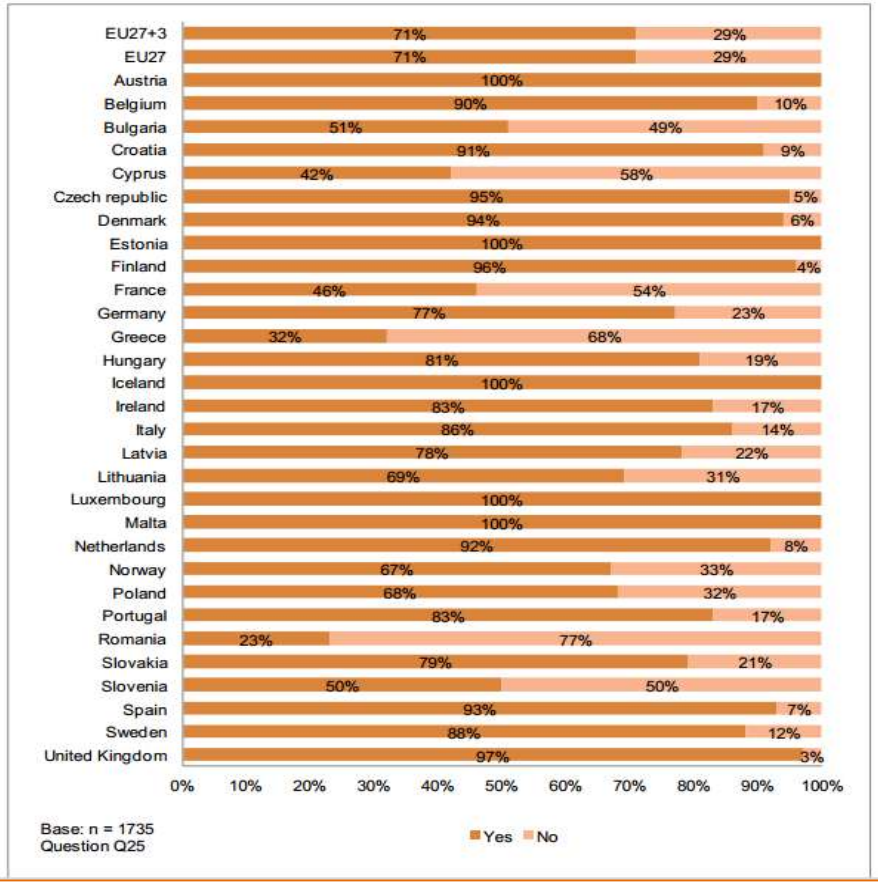
ESR POSITION

- Increase access of PACS and of modern management tools, in order to facilitate protocols and dose optimisation.

European Hospital Survey:
Benchmarking Deployment of eHealth Services (2012-2013)

Figure 35: Availability of Picture Archiving and Communication System (PACS), Country-level results

Answer to Q25: "Does the hospital use a Picture Archiving and Communication System (PACS)?"



FROM IAEA DRAFT SAFETY STANDARDS

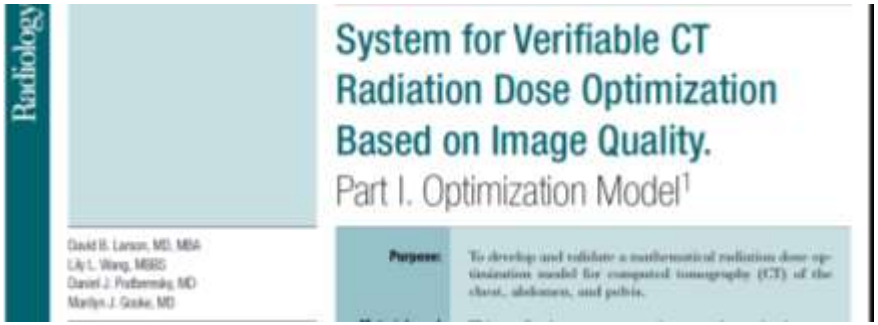
- When medical radiological equipment and software are to be part of a digital network, suppliers should facilitate interconnectivity with other relevant systems

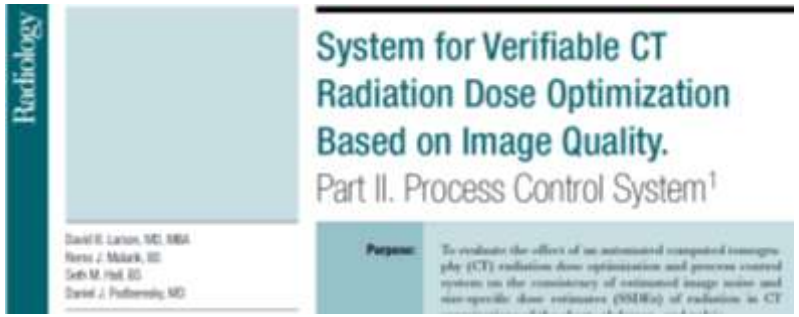
4.3. Dose and image Quality

- Dose measurement and image quality assessment need to be done simultaneously.
- No standardised method to access the resulting image quality is currently available.

ESR View

- "**Appropriate image quality**" is not easy to assess. Many medical physicists have used SNR and CNR to test it but this does not tell us whether the quality is adequate to answer a concrete clinical question
- In other words: together with the exposure, one (i.e. radiologist readers) would have to analyse image quality





Conclusion: CT image quality and radiation dose can be mathematically predicted and optimized on the basis of patient size and radiologist-specific image noise target curves.

Conclusion: Implementation of an automated CT radiation dose optimization system led to verifiable simultaneous decrease in image noise variation and SSDE. The automated nature of the system provides the opportunity for consistent CT radiation dose optimization on a broad scale.

ESR POSITION

- Need to develop and to standardise automatic systems for dose optimisation based on image quality

4.4. Education and Training

- The CT manufacturers propose specific training programs on existing and new dose reduction techniques and on the use of these product features in daily practice.

- The provision of specific training curricula should ensure that the CT user is well trained on dose optimisation and facilitates dose awareness in daily practice

Education & Training Focus

- The education & training focus indicated in the title is not reflected by the paper
  - suggest improving the training focus
  - explain HOW and WHAT should be trained
  - include reference to MEDRAPET project
  - define KSC regarding CT optimisation for each of the professionals involved
  - consider including CT optimisation syllabus proposal in annex
  - stronger emphasis on teamwork concept
  - industry role should be limited to the delivery step
  - should consider the European heterogeneities in training and certification

4.5. Audit

- Another very important tool in the process of CT dose optimisation are clinical audits.
- Clinical audits should consider the whole patient pathway including justification and optimisation

NEED FOR MANAGEMENT TOOLS

CLINICAL AUDIT

- 26 Level 1 (basic audit templates)
- 19 Patient Safety Standards
- Including the major steps of the workflow

HOLISTIC APPROACH

6. Conclusion

The process of CT dose optimisation is possible if

- The CT manufacturers provide the necessary tools for dose reduction and management on CT scanners including specific training on dose reduction methods

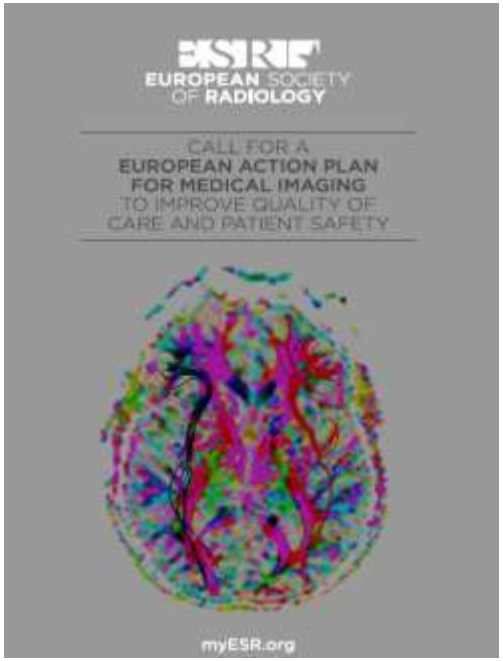
- The stakeholders involved in CT imaging are given adequate opportunity to be properly trained and educated on the existence and use of these tools

ESR SUGGESTIONS

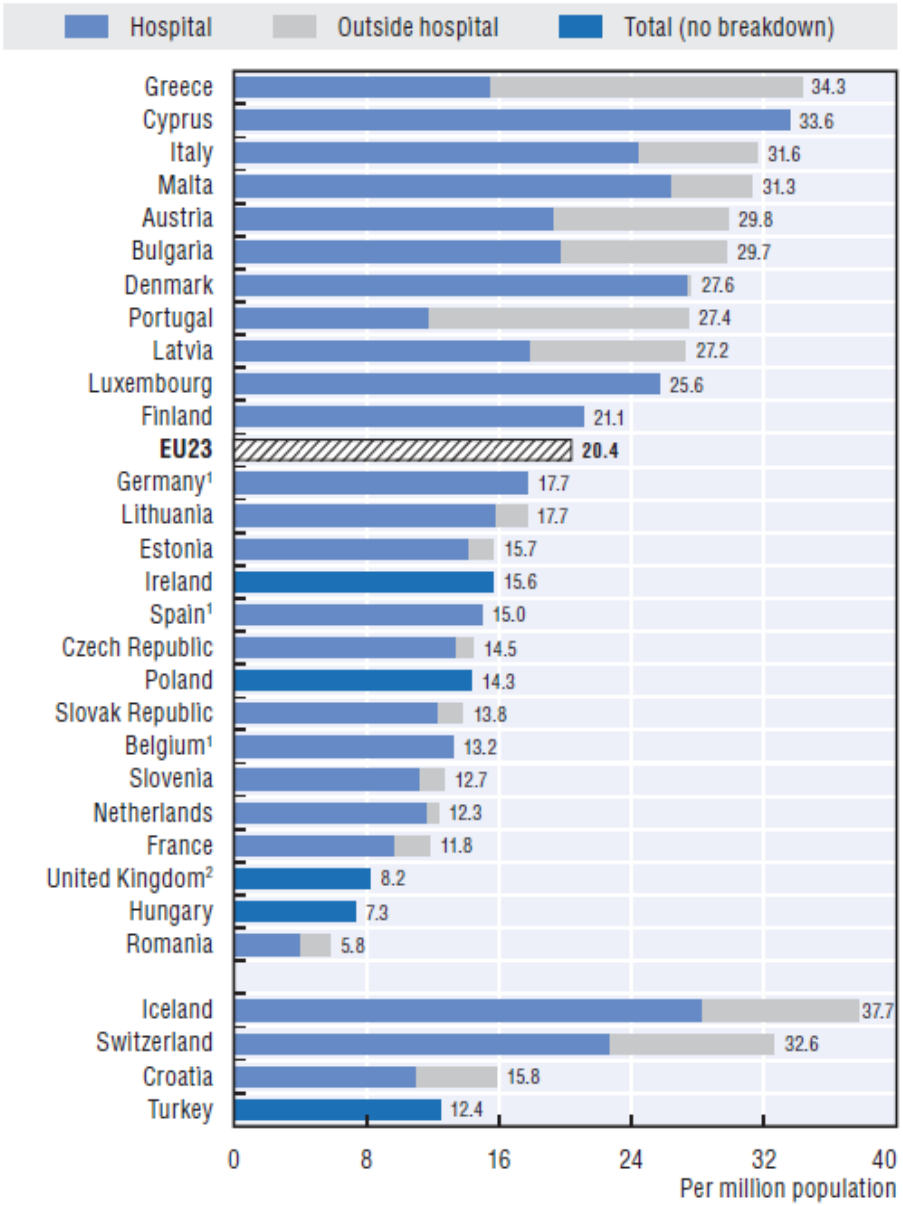
- The education & training focus indicated in the title is not reflected by the paper
- Demonstrate and emphasise team effort throughout document
- Refer to the important role and responsibility of the head of department in regard to ensuring this team effort
- The document should clearly state that any dose optimisation tool developed should be included in the equipment and not be considered as an option when a department buys it.
- Importance of PACS and of modern management tools should be more highlighted
- PET/CT is not addressed in this paper

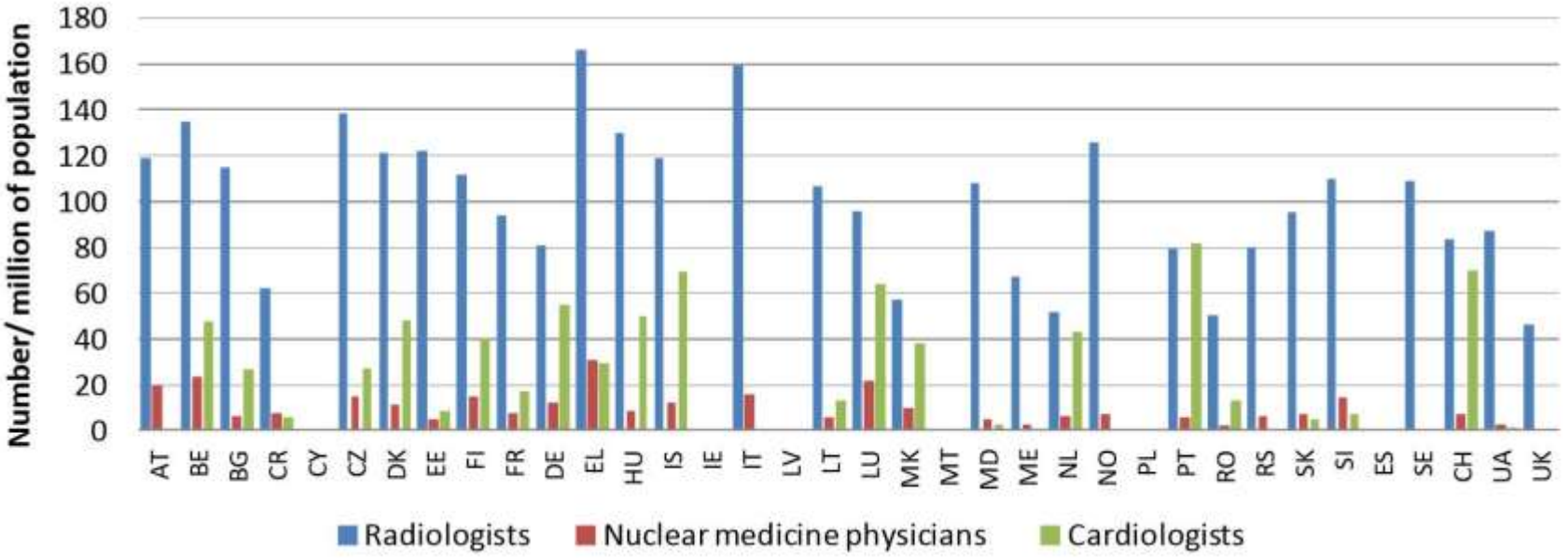
ESR SUGGESTIONS

- European heterogeneities, highlighted by DoseDataMed 2 report, in manpower, equipment numbers and age (COCIR)

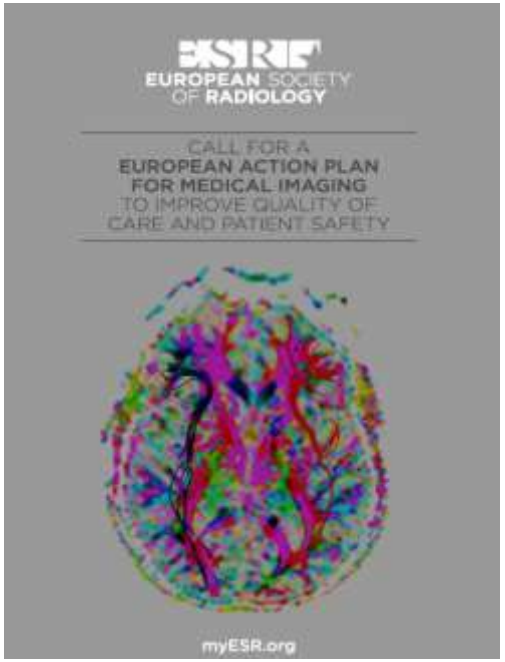


3.4.2. CT scanners, 2010 (or nearest year)




Number/ million of population
180
160
140
120
100
80
60
40
20
0
AT
BE
BG
CR
CY
CZ
DK
EE
FI
FR
DE
EL
HU
IS
IE
IT
LV
LT
LU
MK
MT
MD
ME
NL
NO
PL
PT
RO
RS
SK
SI
ES
SE
CH
UA
UK
Radiologists
Nuclear medicine physicians
Cardiologists

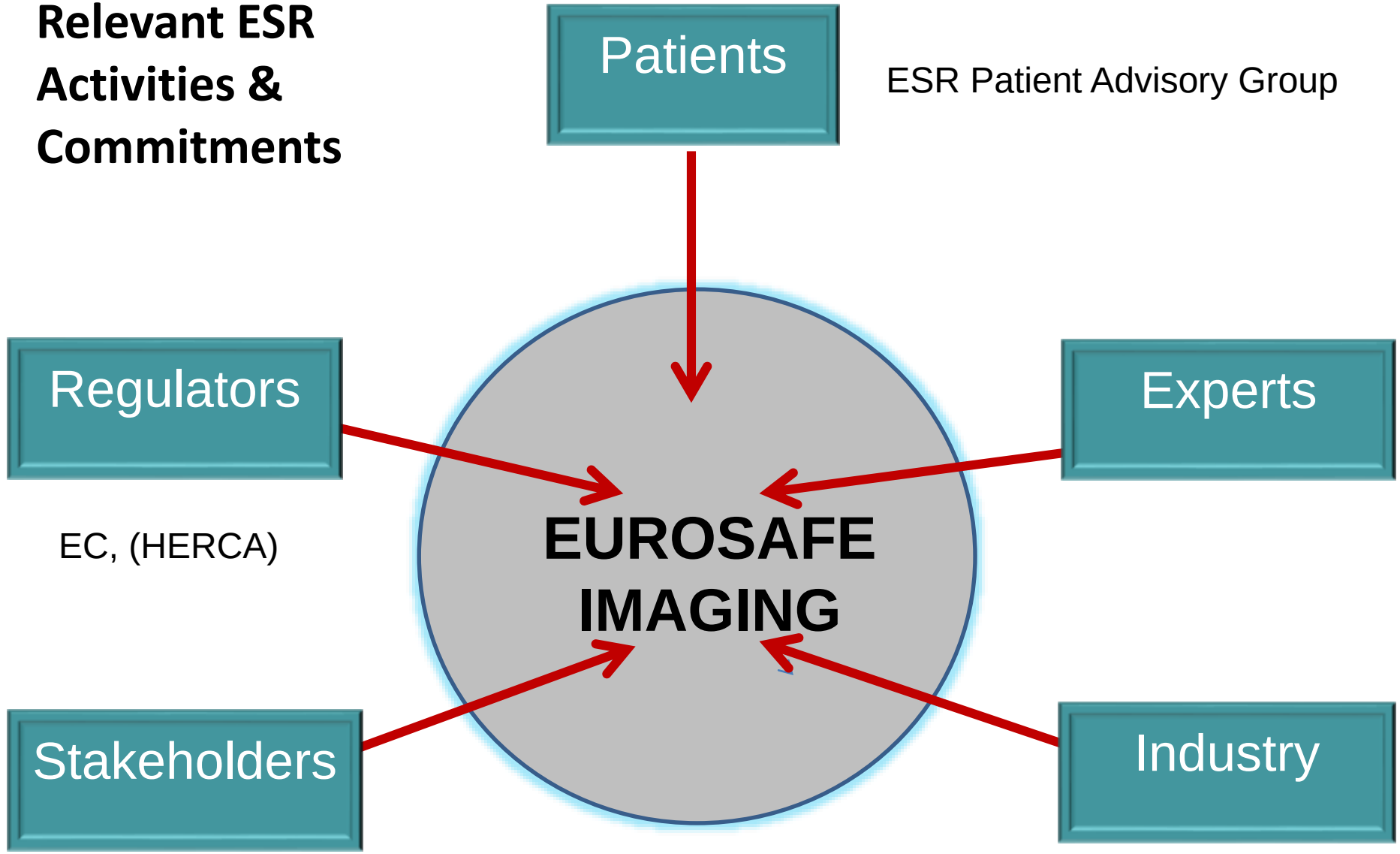
HERCA should take a formal position about these heterogeneities, and especially about the necessity to update the European park of CT according to the needs of radiation protection.



ESR Activities & Commitments

CT dose optimisation

Relevant ESR Activities & Commitments



EuroSafe Imaging Call for Action

- Translation of the IAEA-WHO Bonn Call for Action into a European perspective

THE POINTS

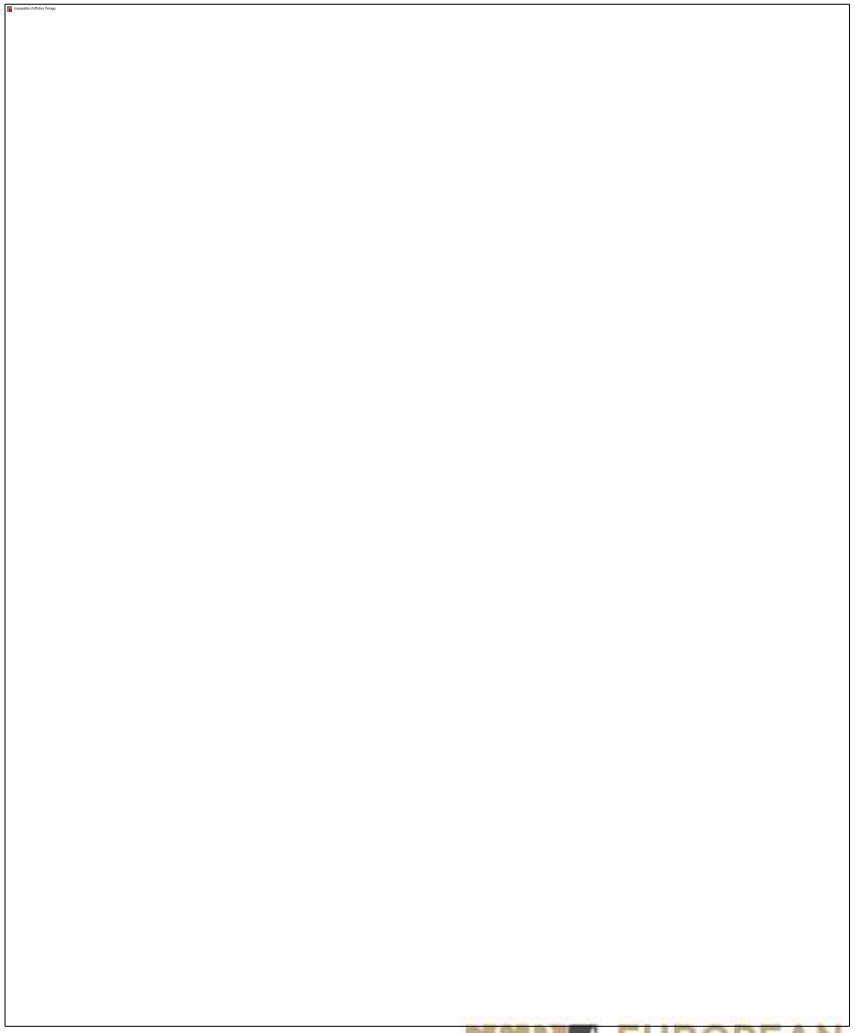
IAEA-WHO

- 1: Justification
- 2: Justification
- 3: Optimisation and Safety
- 4: Optimisation and Safety
- 5: Manufacturers' role
- 6: Education
- 7: Research
- 8: Information
- 9: Safety culture
- 10: Patient
- 11: Globalisation

EUROSAFE IMAGING

- 1: Clinical Decision Support
- 2: Clinical audit
- 3: PiDRL tender, data collection
- 4: Equipment update policy
- 5: MOU with COCIR
- 6: e-courses, MEDRAPET project, ECR
- 7: MELODI
- 8: Website, ESR newsletters
- 9: GPS and KIQSI
- 10: PAG
- 11: Network of campaigns

Action 3: European Paediatric DRL project



Public Workshop Oct. 15-17, Lisbon/PT

To discuss the guidance document and collect feedback and input from major stakeholders

Key aspect: appropriate image quality

- Often neglected in particular by regulatory bodies at national and European level
- Unless we guarantee the quality needed for a specific imaging task, reducing exposure in the process of optimisation becomes useless
- Appropriate image quality = not easy to assess! Need to analyse image quality together with exposure!

→ ESR willing to take up this complex topic

THE POINTS

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Action 4: Equipment update policy

- ESR paper on renewal of imaging equipment
  - Equipment life cycles are becoming shorter due to rapid technological advances
  - Equipment older than 10 years must be replaced to avoid delays in diagnosis and safety problems
  - For efficient maintenance and replacement, ESR advocates annually updated 5-year plans
  - Updating of the CT equipment across Europe

Action 4: CT Checklist

- Developed by ESR RP Subcommittee
- to aid radiologists, radiographers and other professionals in providing safe CT services to patients
- document details the most important aspects to consider for workflow management and dealing with patients before and after an examination, and also includes a list of self-assessment questions for CT radiographers and imaging departments

→ Available online at www.eurosafeimaging.org

Action 5: Cooperation with industry

- Memorandum of Understanding between ESR & European medical industry association COCIR
- COCIR representative on EuroSafe Imaging Steering Committee

ACTION 8: EUROSAFE IMAGING SURVEYS

➢ The aims are to

- Build a European repository based on dose exposures for specific clinical indications that would be most helpful for self-benchmarking and for future establishment of diagnostic reference levels (DRLs)
- Provide insights into the influence of the age of the equipment on dose exposure

➢ Purpose is to collect data on

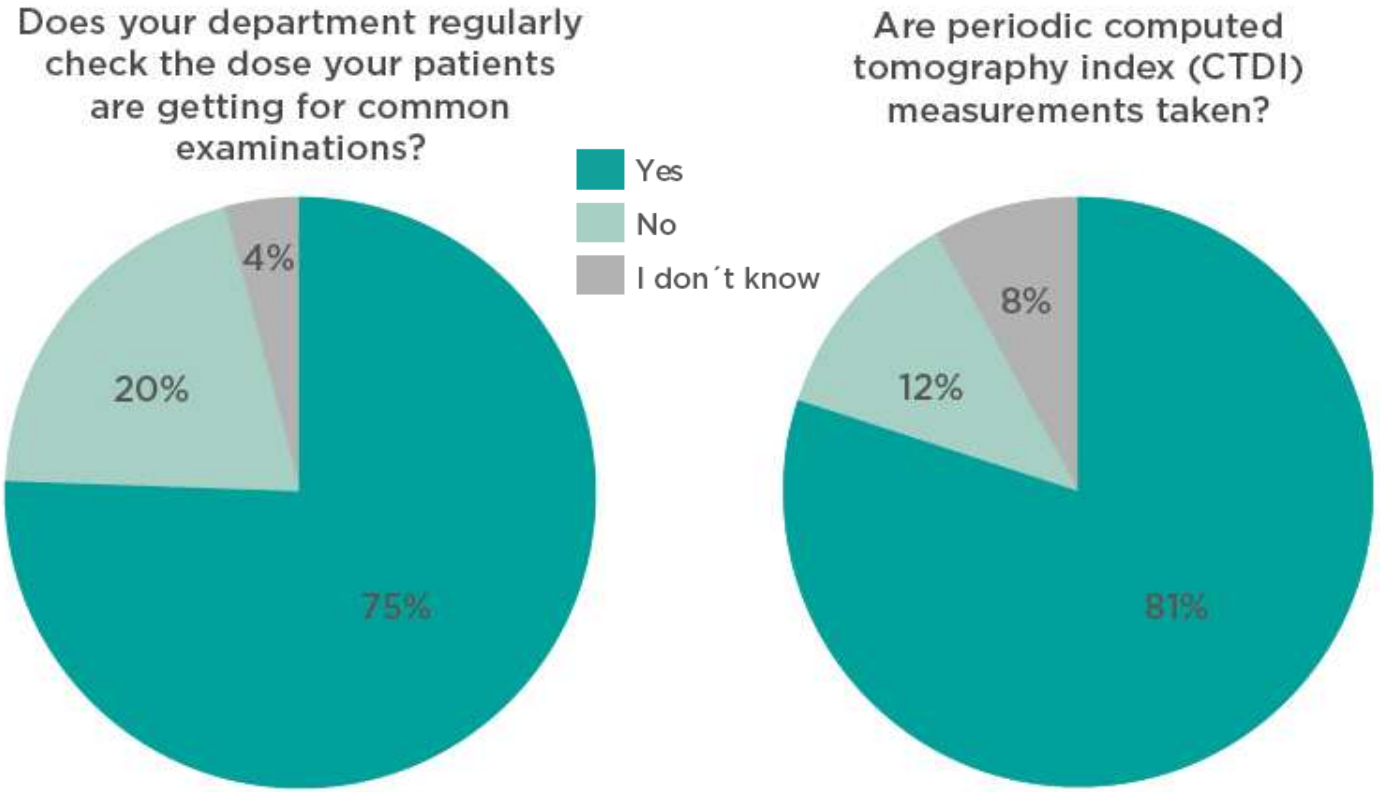
- Standard practice
- Scanner specifications
- Adult patient data

IS YOUR IMAGING EUROSAFE?

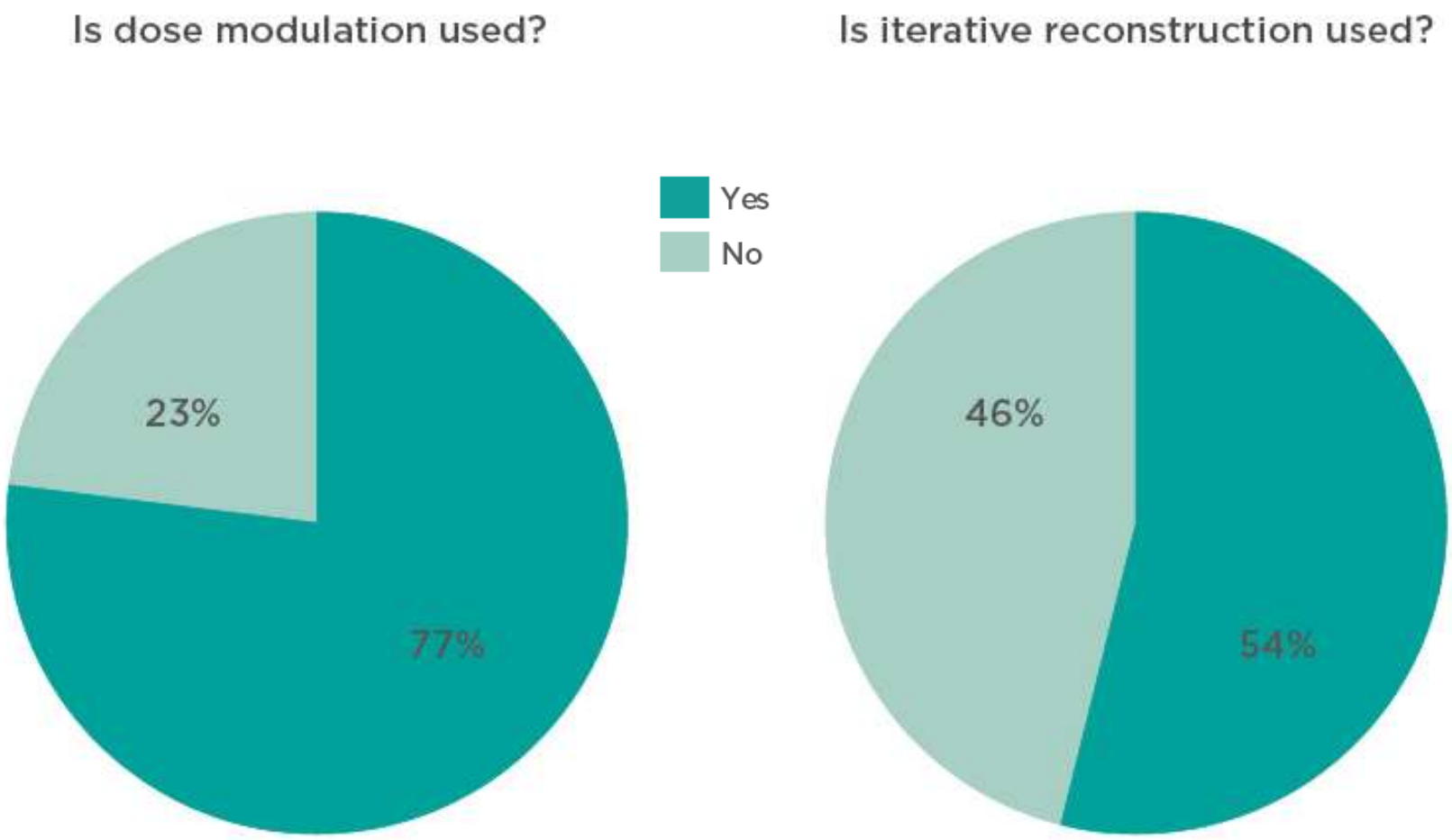
- CT head: acute stroke
- CT chest: pulmonary embolus
- CT head: acute head trauma
- CT chest: rule out pulmonary metastases of extrathoracic cancer
- CT chest: HRCT for diffuse parenchymal disease
- CT abdomen: liver metastases
- CT abdomen: urinary calculus
- CT abdomen: appendicitis
- CT Colonography
- Cardiac CT: Calcium coronary scoring

PRELIMINARY SURVEY FINDINGS

Head CT for Acute Stroke *



*(*Status: 27 January 2015. As the survey is still open, the data displayed is preliminary.)*



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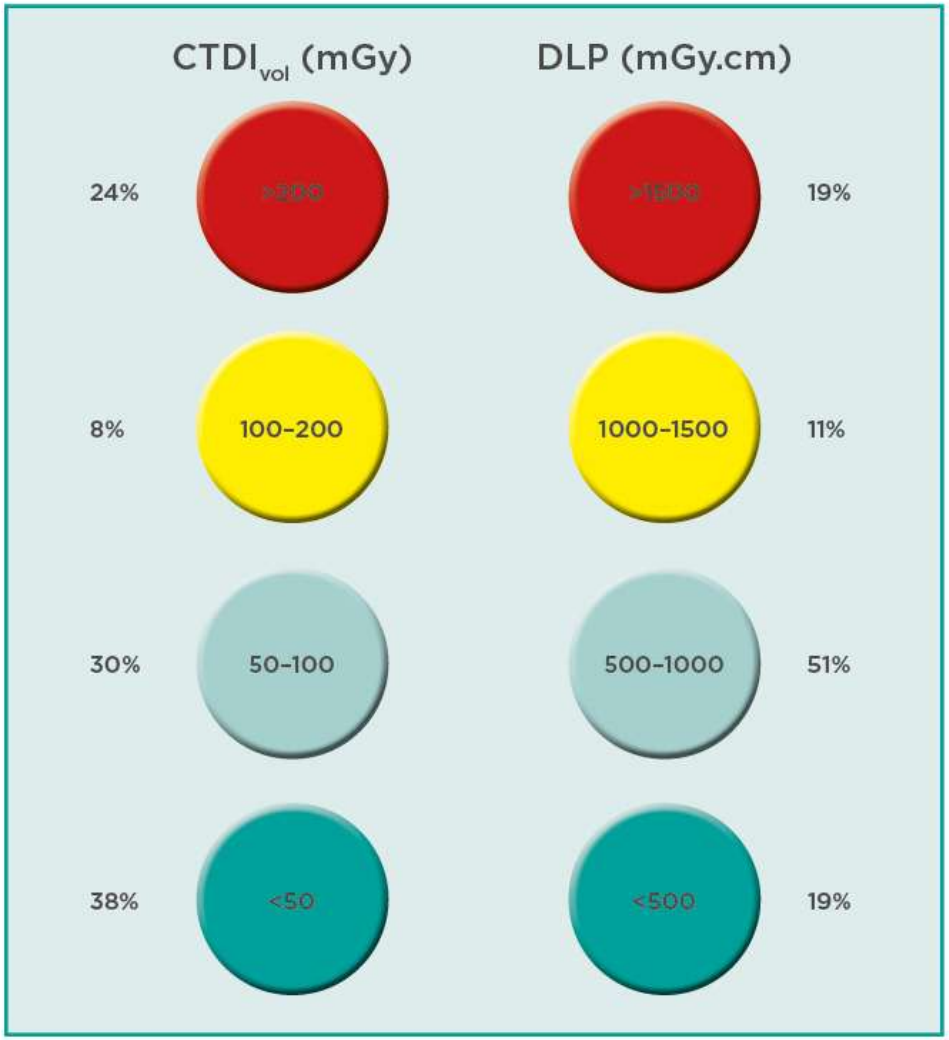
Exposure Values



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Priorities 2015 related to optimisation

➔ Launch of a dose management project

➔ Continue CT dose data collection effort through surveys with the aim to allow for benchmarking: HERCA support would be great!

➔ Work on DRL concept