Medical Physicists
Improving treatments, saving lives

EFOMP presentation to the HERCA multi-stakeholder meeting.

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3rd HERCA MSM on CT Optimisation
(6 March 2017, Vienna, Austria)
Membership (NMOs)

Austria (AT): Belgium (BE): Bulgaria (BG):
Croatia (HR): Cyprus (CY):
Republic Czech (CZ): Denmark (DK):
Estonia (EE): Finland (FI): France (FR):
Germany (DE): Greece (EL): Hungary (HU):
Ireland (IE): Italy (IT): Latvia (LV):
Lithuania (LT): Macedonia (MK): Moldova (MOL):
Malta (MT): The Netherlands (NL):
Norway (NO): Poland (PL): Portugal (PT):
Romania (RO): Russian Federation (RU):
Serbia (RS): Slovakia (SK): Slovenia (SI):
Spain (ES): Sweden (SE): Switzerland (CH):
United Kingdom (UK)

Company Members
PTW Freiburg
Standard Imaging
Scandidos
Varian Medical Systems
Elekta
RTI

> 8000 physicists and engineers working in medical physics

New Entry (2016): Republic of Moldova
Mission

• to harmonize and advance medical physics throughout Europe,

• to strengthen the activities of the National Member Organisations (NMO)
  – bringing about and maintaining systematic exchange of professional and scientific information,
  – the formulation of common policies, and
  – promoting education and training programmes.
Objectives

- coordination activities with NMOs
- **collaborating with other international organisations**, particularly the IOMP
- disseminating information through publications and meetings
- **encouraging scholarship and the exchange of Medical Physicists between countries**
- guidelines for education, training and accreditation programmes
- recommendations on the appropriate responsibilities, organisational relationships and roles of workers in Medical Physics
- encouraging the formation of Organisations for Medical Physics where such organisations do not exist.
Self commitments of EFOMP during HERCA MSM CT Optimization Wien 2016

• Provide a course on ‘Imaging in Radiotherapy’ with a particular focus on CT through the ESMPE
• Consider the continuation of EUTEMPE.RX through self-funding to expand the number of trained MPEs for radiology in Europe

HERCA suggestion

“a course on imaging in radiotherapy would be excellent and perhaps EFOMP could work together with ESTRO on this subject”
ESMPE
Diagnostic and Interventional Radiology
7th edition 2017 - 26-28 Jan 2017

Imaging in Radiotehrapy

Organizers
Jaroslav Ptáček, Tereza Hanušová (Czech Republic)
Gianfranco Loi (Scientific Chair), Alberto Torresin (Chair of the School), Marco Brambilla (EFOMP Secretary General), John Damilakis (EFOMP President)

Lecturers

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<tr>
<th>Name</th>
<th>Affiliation</th>
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<tr>
<td>Jens M. Edmund</td>
<td>Herlev and Gentofte Hospital, University of Copenhagen, Department of Oncology, Division of Radiotherapy, Copenhagen, Denmark</td>
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<tr>
<td>Christian Fiandra</td>
<td>University of Torino, Department of Oncology, Torino, Italy</td>
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<tr>
<td>Rob Tijssen</td>
<td>University Medical Center - Utrecht, The Netherlands</td>
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<tr>
<td>Gianfranco Loi</td>
<td>University Hospital of Novara, Department of Medical Physics –Novara, Italy</td>
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<tr>
<td>Emiliano Spezi</td>
<td>University of Cardiff, School of Engineering – Cardiff, UK</td>
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<tr>
<td>Alberto Torresin</td>
<td>Hospital of Niguarda, Department of Medical Physics – Milano, Italy</td>
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<tr>
<td>Uulke van der Heide</td>
<td>Netherlands Cancer Institute - Amsterdam, The Netherlands</td>
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<tr>
<td>Stina Svennson</td>
<td>Raysearch Laboratories, Stockholm, Sweden</td>
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<tr>
<td>Dimitris Visviskis</td>
<td>INSERM - Brest, France</td>
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Advanced structural imaging for radiotherapy simulation and planning - 4DCT and MRI imaging for simulation and planning. Technological requirements, protocol optimization for radiotherapy applications, imaging issues, Quality Assurance.


Advanced imaging for treatment adaptation - MRI Image guided radiotherapy. Applications of quantitative imaging provided by PET and MRI in treatment adaptation according to early response.

Imaging for treatment guide and verification - IGRT, CBCT, Ultrasound, EPID and fluoroscopy, Optical surface imaging : Devices, practices, Quality assurance, clinical examples.

Cone beam CT - Acceptance testing and Quality controls, dosimetry, use of CBCT in adaptive radiotherapy, motion management.

Tools for image integration in the radiotherapy workflow - Overview of image registration methods, deformable image registration, clinical application of DIR, ROI propagation in adaptive radiotherapy, atlas based segmentation, practical demonstrations.
Current Actions of the EFOMP: Education & Training: CT in RT

The school has been attended by 46 Medical Physicists

Low income countries have had a subsidized fee from EFOMP

The school was recommended by ESTRO

The school has been organized in conjunction with the Czech NMO

Subsidized fees 14
Females: 21 (46% gender balanced)
Mean Age: 38 Years (young audience) (range: 24-56 y)
Current Actions of the EFOMP: Education & Training  Optimised use of CT

European Training and Education for Medical Physics Experts in Radiology

http://www.eutempe-rx.eu/

EU funded project - Main contractors:

Katholieke Universiteit Leuven
### General Knowledge Skills Competences in D&IR

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<th>MPE03 – Monte Carlo simulation</th>
<th>MPE04 – Innovation and Advanced Physics</th>
<th>MPE05 – Use of Anthropomorphic Phantoms</th>
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### Specific Task for MPE

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<th>MPE07 – Optimization of X-ray Imaging</th>
<th>MPE06 – Development of Advanced QA Protocols</th>
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### Modality Specific Modules

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<th>MPE08 – CT</th>
<th>MPE09 – Mammography</th>
<th>MPE10 – Interventional Radiology and Cardiology</th>
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### Risk Assessment and Dosimetry

| MPE02 – Radiobiology | MPE11 – Dose Management for Pregnant and Pediatric Patients | MPE12 – Personnel Dosimetry and Communication Results to RPE |
Role of the medical physicist in CT imaging and patient dose optimization: CT imaging and patient dose optimized with objective means

Image quality definitions

Linear systems theory, types of contrast (subject, image and display), unsharpness (LSR, PSF, LSF, MTF), lag, noise (including sources, noise power spectra, effect of lag on noise, noise propagation in image subtraction), SNR (including Rose model), Wagner’s taxonomy, CNR, NEQ, DQE and how these metrics behave as a function of dose.

Human vision characteristics

the receiver operating characteristics (ROC), Multi-Alternative Forced Choice studies (M-AFC), LROC, AFROC, (mathematical) model observers such as the ideal or anthropomorphic linear model observer.
Self commitments of EFOMP during HERCA
MSM CT Optimization Wien 2016

BSS transposition in National Legislation

Evaluation of national actions regarding the transposition of
requirements in the medical sector

Consortium:
European Federation of Organisations for Medical Physics (EFOMP, UK, Lead Contractor)
European Society of Radiology (ESR, Austria)
European Federation of Radiographer Societies (EFRS, The Netherlands)

Workshop “BSS Transposition in the Medical Sector” Brussels, 24-25 January 2017

Final report Under Preparation
Self commitments of EFOMP during HERCA MSM CT Optimization Wien 2016
Quality control in cone-beam computed tomography (CBCT)
EFOMP-ESTRO-IAEA protocol

EFOMP CBCT working group set up in December 2013

Unification of quality controls in CBCT for dental, Angiography and Radiotherapy applications

- to develop a practical, unifying protocol for image quality control (and dose) of CBCT
- using contrast: noise ratio and Fourier measures

Progress (2016)
Approved From IAEA
Waiting from approval from ESTRO

- Image quality factors
- Phantoms
- Software
- Dosimetry
Continuing actions of the EFOMP

With other European Societies

Memoranda of Agreement with subject specific societies

• ESTRO
• EANM
• ESR
• EFRS

to work together in a spirit of mutual cooperation
MoU EFOMP-COCIR
signed in Wien March 2017


EFOMP will organize a session (three hours)
1. Risk assessment in CT imaging
2. Image quality parameters in modern CT imaging
3. Image reconstruction in CT - from traditional FBP to iterative methods

EFOMP will organize a session (four hours)
1. Patient specific dosimetry in CT
2. Managing patient dose with CT dose tracking systems
3. CT DRLs, notification values, alert values
4. EFOMP Guidelines on the transposition of EU BSS art. 60 in CT

A joint session and a round table EFOMP-COCIR on CT acquisition protocol optimization
MoU EFOMP-COCIR
signed in Wien March 2017


COCIR will organize a session (four hours) to explain how different vendors implement in their equipment:
1. TCM modulation
2. Iterative reconstruction
3. Automatic kV selection
4. Registration and display of dosimetry indexes

COCIR will organize a session (four hours) to explain how different vendors are planning future developments
1. Physics and technology - Single tube multi energy or double tube?
2. Spectral multi energy acquisitions - CT photon counting
3. Organ dedicated CT
4. CT dose metrics

A joint session and a round table (four hours) EFOMP-COCIR on CT acquisition protocol optimization
Organization of a **joint session EFOMP-COCIR in the ECMP 2018 Copenhagen** about actions taken by different vendors to fulfill the requirements of art.60 of the new BSS (registration and display of dosimetry indexes in CT examinations)