EFOMP

The European Federation of Organizations for Medical Physics Bulletin

European Medical Physics News
Winter 2019

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Cover page, top photo: EFOMP School for MPEs in Radiotherapy, Warsaw, October 2019

Editorial

Dear Readers,

The cover page of this issue refers to the EFOMP Board and Council meetings held in Warsaw, Poland, on 11-13 October, 2019.

This Winter issue of European Medical Physics News starts with the latest news from the President of ECMP 2020 (Turin, 23-26 September 2020).

EFOMP has recently established several Working Groups: on page 6 our colleague F. Zanca introduces the WG on Artificial intelligence.

Two articles on the experience of EFOMP Schools can be found on p. 7 and p. 9: in this last contribution, Prof. P. Sharp faces the issue of Statistics in Medical Physics.

The section on "Medical Physics research news" starts on p. 36, with articles on "A career built on modelling", "Commissioning of Model-based Dose Calculation Algorithms in Brachytherapy" (p. 38), "Real-Time Adaptive Particle Therapy Of canceR – The RAPTOR consortium" (p. 41), "Extending MRI Beyond the Current Limits: Of Needles, Gases, and Mummies" (p. 43).

The section "EFOMP Company member news" contains articles from iRT Systems (p. 46) and from RTsafe (p. 48).

What medical physicists do in their free time? The EMP News Editor, Jaroslav Ptáček, Czech Republic, tells us about his "analogue" story with B/W photography (p. 58). On page 60, we will learn of the hobbies of medical physicists in Serbia (Hobbies and sporting activities of Serbian medical physicists).

Finally, the section on "Book Reviews" contains a review by Prof. Alberto Del Guerra, published in Physica Medica – European Journal of Medical Physics, on the book Hendee's Physics of Medical Imaging, 5th Edition (p. 61).

This is my last Editorial as Editor-in-Chief of EMP News, since my role as Chairperson of the Communications and Publications Committee ends on December 2019. From the next Spring Issue, the new Editor-in-Chief will be Prof. David Lurie, new Chair of the CP Com: good luck, David! I would like to thank all EMP News Editors (members of the CP Com), the copyeditor Michael Strahl, and in particular our CP Com Secretary, Efi Koutsouveli. Your passionate and effective collaboration is warmly appreciated.

Also our Committee Secretary, dr. Efi Koutsouveli, will terminate her term on 31 December 2019: our thank you! message is on p. 84.

The Editorial Board of EMP News thanks all contributors of the articles of this Winter 2019 issue!

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*Paolo Russo, Editor-in-Chief & Your editorial team (*pubcommittee@efomp.org*).*

European Medical Physics News, 02 December 2019.


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Third European Congress of Medical Physics in 2020

Autumn has been an active time for the local organisers of the ECMP congress. New congress information has recently been published through the congress web pages and other media channels. Since August, the main structure of the conference programme has been formulated with four parallel sessions and a variety of topics. This article will provide a quick overview of the main parts of the programme, mainly regarding the pre-congress satellites and refresher sessions.

Conference related activities will begin on Wednesday the 23rd of September 2020, a day before the actual ECMP 2020. The Italian Association for Medical Physics (AIFM) will host their 11th national conference on the Wednesday. Simultaneously, full day European School for Medical Physics Expert (ESMPE) editions will cover three pre-congress satellite workshops in innovative areas of medical physics: artificial intelligence, nuclear medicine dosimetry and patient specific QA in radiotherapy. Based on these subjects and also on the possibility to apply for the ENEN+ grants, an active participation from a variety of European medical physicists is anticipated. The ECMP 2020 exhibition, opening with cocktail reception, will conclude the Wednesday programme.

The ECMP 2020 congress programme will launch on Thursday the 24th of September with refresher courses in four simultaneous sessions. The radiotherapy refresher is entitled "Small field dosimetry: development and challenges". The nuclear medicine refresher focuses on the area of quantitative imaging. The diagnostic and interventional radiology refresher is entitled "Advanced CT acquisition", while the fourth parallel refresher dedicated to overarching topics is entitled with the congress motto: "Embracing Change, Sharing Knowledge". Each refresher will be of one hour duration and will include two talks and a discussion. The objective of the congress refreshers is to strengthen basic knowledge and to give essential updates to the methods and technology we face in our daily work. The Thursday programme will continue with 15 scientific sessions, 4 joint sessions (ESTRO, EFRS, COCIR and AAPM) and the ECMP welcomes Spain session. The first congress day will end with the opening ceremony followed by a welcome cocktail reception.

The Friday refresher sessions will cover topical areas such as MRI and dual energy CT in radiotherapy, hybrid imaging, artificial intelligence and new technological frontiers. The subsequent 13 scientific sessions, 4 joint sessions (EANM, IAEA, ESMRMB and EuSoMII), 2 special focus sessions and ECMP welcomes Spain session will be an attractive mix of professional topics such as mentoring and training, new technologies, multimodalities and radiomics. On Friday evening, the congress social event will offer a memorable night at the Lingotto Congress Centre.

The final day of the congress will start with refresher sessions presenting on stereotactic body radiotherapy (SBRT), theranostics, diagnostic reference levels, and machine learning with clinical data. The programme will then be concluded with 5 scientific sessions, a joint session with ESR, plenary session, awards for best presentation and poster, and the closing session.

— We are looking forward to European colleagues presenting their recent scientific findings in the congress. Abstract submission is open!

Based on the scientific content, Physica Medica - European Journal of Medical Physics (EJMP), will publish a focus issue in 2021 containing up to 50 selected papers from contributions (oral or poster) from ECMP 2020. The papers will be selected by the guest editors and the editor-in-chief on the basis of the high scientific quality of the presentations.

Torino offers a wide range of accommodations, from luxury hotels to good budget lodgings. ECMP delegates will have the opportunity to book rooms in selected city hotels located either in the congress venue area or in the city centre through a congress-dedicated online booking system. Detailed information on selected hotels and rates as well as booking procedure will be posted in the hotel accommodation section of the conference website in December.

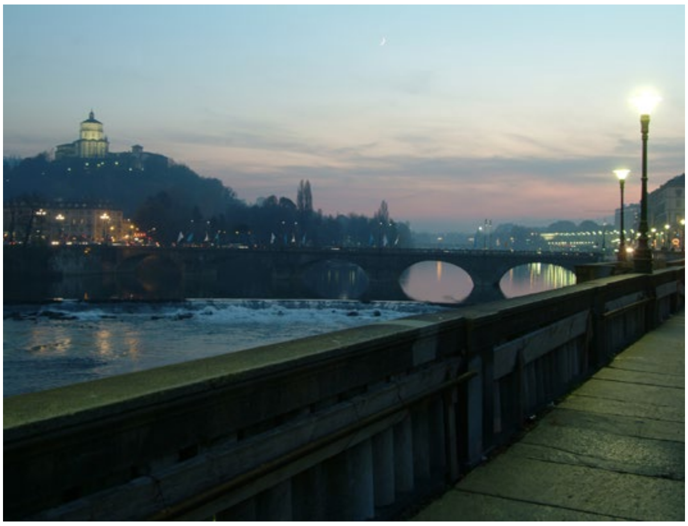


Fig. 1: Figure. A view to Monte dei Cappuccini in Torino. (Photo: City of Torino - Enrico Aretini)

The third ECMP will be held in Torino, Italy, 24-26 September 2020. You may find further information on the congress web page (www.ecmp2020.org) and the EFOMP web page (www.efomp.org), please check social media (LinkedIn, Facebook, Twitter, Instagram) for constant updates.

Wishing you a pleasant holiday season.

Mika Kortesniemi

President of ECMP 2020

Dr Mika Kortesniemi

Chief Physicist and Adjunct Professor in the HUS Medical Imaging Center, University of Helsinki, Finland

Dr Mika Kortesniemi works as the Chief Physicist and Adjunct Professor in the HUS Medical Imaging Center, University of Helsinki, Finland. His professional focus is on the quality assurance, dosimetry, optimisation and radiation protection of x-ray modalities, especially the evolving CT technology. His research work is primarily related to radiological optimisation, utilizing anthropomorphic phantoms and Monte Carlo simulations. Dr Kortesniemi is the past chair of EFOMP's Science Committee. In addition to his primary position in HUS Medical Imaging Center, Dr Kortesniemi is also involved in IAEA, ICRP and ESR collaboration, and quality audits in radiology.

Establishment of an EFOMP working group on Artificial Intelligence

Fig. 1: Group photo during the first face-to-face meeting in Patras, 9th-10th September 2019.

Recently a new working group on Artificial Intelligence has been established by EFOMP. The main objective of the group is to build an educational and professional Curriculum for medical physicists working in diagnostic and radiotherapy. A strong team of Medical Physicists Experts (MPEs) working in Europe has been appointed.

Why create such a WG? Recently there has been a significant push towards the development of applications of Artificial Intelligence (AI) in medicine, and AI was the biggest single topic discussed in sessions and on the exhibition floor of medical conferences like ESR, AAPM, and RSNA over the past years. Such a fast-changing healthcare environment will also affect the future of Medical Physics, possibly presenting new opportunities but also the need for medical physicists to re-shape their roles in healthcare (1).

Our field is multidisciplinary by nature, and our professional value comes from our ability to interface with other specialties across the hospital and synthesise the knowledge from a diverse set of disciplines in order to provide the most educated decision that merges the context, data, clinical information and other available knowledge.

Therefore, there is a need to invest in growing the Knowledge, Skills and Competences (KSC) of MPEs around AI. The first steps in the direction of creating such a curriculum have already been taken during our first face-to face meeting, held at the University of Patras (Greece) on 9th-10th September 2019.

The starting point of our discussion has been the revision of the role of the MPE, as described in the EU RP 174 and Annex1 and the definition of KSC needed for each domain where the MPE is involved.

Following the RP174, the MPE must contribute to maintaining and improving the quality, safety and cost-effectiveness of healthcare services through patient-oriented activities. This requires expert action, involvement regarding the specification, selection, acceptance testing, commissioning, quality assurance/control, installation design, surveillance and optimised clinical use of medical devices, including, for example, AI software.

With the curriculum we aim to support MPEs in answering for example some of the following questions:

- How can we perform, and should we perform QA on such tools?
- How can we make sure that the used tools are properly integrated in the clinical workflow and how can we perform surveillance of such tools in the long term?
- How can we collaborate with industry to improve these tools?
- How can we work with other stakeholders to go behind imaging for AI applications, like radiomics and the usage of non-imaging information to assess or develop such tools for research use?
- How can we use these tools to improve our profession for applications which go behind image interpretation, as for example tools for automated QA, protocol or dose optimisation?
- How can we support radiologists or radiotherapist and other relevant stakeholders in the selection of AI applications for their department?

These are just few of the many questions raised during our first meeting and that we will need to answer during this journey!

We hope with our work to be helpful to the European MPE community in order to allow them to perform their profession with the highest levels of standard of care, while staying patient-centric.

Federica Zanca, PhD, Chair of the WG on Artificial Intelligence

Federica Zanca received her Master Degree in Physics at Ferrara University, Italy (1997) and obtained her master-after-master in Medical Radiation Physics (2005) and a PhD in Biomedical Science at the Faculty of Medicine of the KU Leuven in Belgium (2009). For the past 20 years, she has been conducting clinical research in medical imaging in both hospital (UZ Leuven, Belgium), academic (Professor at Imaging and Pathology Department of KU Leuven) and industrial settings (in Healthcare large corporations). Currently she is self-employed and works as Senior Consultant helping industry, academic and hospital business stakeholders to thrive towards clinical excellence.

References

1. The European Federation of Organisations for Medical Physics (EFOMP) White Paper: Big data and deep learning in medical imaging and in relation to medical physics profession. Kortesniemi, Mika et al. Physica Medica: European Journal of Medical Physics, Volume 56, 90 - 93

ESMPE – State-of-the-art and new trends of angiographic equipment: Image quality, Patient and Staff dosimetry

EFOMP and COCIR jointly organised last summer's edition of the ESMPE Summer School in Prague. The school was aimed at advanced tasks connected with angiographic equipment and covered the main physics aspects of the equipment technology, patient and staff dosimetry and optimisation.

When I first saw the programme for the School I was very excited to see that representatives from GE, Canon, Philips and Siemens would be providing lectures. I felt that this was a unique and essential aspect that not many meetings offer. The enticing programme attracted 75 participants who had travelled from Austria, Belgium, Cyprus, Croatia, Czech Republic, Estonia, France, Finland, Greece, Germany, Hungary, Ireland, Italy, Netherlands, Portugal, Poland, Republic of Moldova, Romania, Sweden, Slovenia and Switzerland.

The school lasted two and half days and had an optional exam at the end. The first morning started with setting the scene. We heard from two Radiologists who spoke about common interventional and cardiology procedures, what it is that the Radiologists needs to be able to see, the problems they face and issues that medical physicists can help with. It was motivating to hear from clinician colleagues and a good reminder that medical physicists are part of a team in the hospital.

Over the course of the School lectures covered a variety of important topics including; an overview of modern systems, cone beam CT, QA as it stands in the new BSS, QC for dosimetry and image quality, dose tracking, radiation protection of staff and eye dosimetry. Expert speakers from across these fields gave well thought out lectures and provided participants with significant understanding and practical information that we can bring back and implement in own departments.

The manufacturer representatives gave us some insight into their latest developments and what we can expect from new technology with an emphasis on dose reduction and image quality improvement. Importantly, these talks were provided with medical physicists in mind and were not a sales pitch.

Another interesting element of the School was the Round Table discussion with the speakers. Optimisation was the main topic of discussion; the importance of the MPE having in-depth knowledge of the equipment (with training provided by the manufacturer), how to optimise the equipment and the role the MPE has as part of the optimisation team.

All the lecture notes were made available online to participants and the exam results and certificates were circulated very shortly after the School.

I was delighted to escape the rain in Ireland and visit sunny Prague. It is a beautiful city and we enjoyed some local cuisine during the social evening. I hope to be able to visit again as part of another edition of ESMPE. Many thanks to the organisers and speakers for a very worthwhile and educational School.

Emer Kenny

Dr. Emer Kenny is a Senior Medical Physicist in the Mater Misericordiae University Hospital, Dublin. She is a registered MPE and works in the field of diagnostic imaging and nuclear medicine. She is Editor of the Irish Association of Medical Physics and serves as an Associate Editor of Physica Medica.

EFOMP SPRING SCHOOL 2020: Statistics in Medical Physics

Frightened of Statistics?

Do statistics frighten you, or just bore you? Do you find it difficult to understand statisticians? Do you know the difference between a standard error and a standard deviation? Well, as a scientist, statistics are an important part of your professional work; whether you need to use them in designing and analysing experiments or in interpreting other people's research.

At ECMP 2018 EFOMP ran a course on statistics which proved very popular. But we recognised that we could only briefly cover the topic in the few hours. So EFOMP, in collaboration with the Hellenic Association of Medical Physics, remedied this by announcing a 3-day course, Statistics in Medical Physics, as part of their European School for Medical Physics Experts. The extra time available means that there will be more time for practical sessions with worked examples. The course is endorsed by ESTRO, ESMRMB and EuSOMII.

So, what skills will you learn? The school opens with consideration of how to design an experiment and analyse the resulting data. For a medical physicist an important question is often how one evaluates a diagnostic test. This is addressed by a session dealing with the trade-off between sensitivity and specificity utilising ROC analysis.

If you want to examine the source of differences between two or more variables in an experiment, then you will need to use applied regression analysis. In the afternoon Marco will talk about the application of analysis of variance and of covariance together with worked examples from medical physics. If the dependent variable is binary (e.g. alive/dead, yes/no) then logistic regression is needed and a discussion of this, together with examples from visual grading experiments, completes the day.

If your experiment involves two or more possible variables, then data analysis requires the application of multiple linear regression This, together with worked examples, forms the start of the second day. How you assess the success of treatment may be addressed by the use of survival analysis and I will be talking about how to create and interpret survival curves.

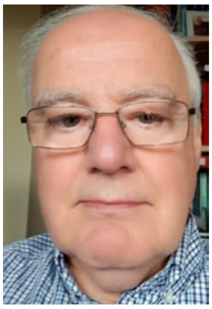
The school finishes with a series of presentations on radiomics, dosimetry and radiotherapy. In radiomics the question of feature evaluation and quality by statistical methods is explored. Quality is again a theme in dosimetry, looking at how uncertainties and the related quality of measurements are handled using statistical techniques. In radiotherapy the problem of agreement such as in dose distributions and volume estimations are investigated.

The course will finish with an (optional) exam.

As you can see, there is much in the course that is relevant to the work of the medical physicist, whether they are working in imaging, therapy or protection, as well as giving a good grounding in the basic principles of statistics.

The course runs from 23rd to 25th April 2020 at the National and Kapodistrian University in Athens. Early registration, up to 15th March, is 300 € which includes coffee breaks, 2 main meals and a social dinner. Registration is via the EFOMP website, www.efomp.org.

We are not claiming that in 3 days we can turn you into a statistician but perhaps we can give you enough understanding of statistical techniques to overcome some of your fears.



Peter Sharp

Peter Sharp is the Emeritus Professor of Medical Physics at Aberdeen University. Until his retirement in 2012 he was Head of the Department of Medical Physics. He set up the first NHS Positron Emission Tomography (PET) Centre in Scotland and chaired the committee that advised the Scottish Government on the introduction of PET for cancer management for the whole of the Scottish health service. He has published over 150 papers in peer reviewed journals and 3 books. He has been awarded the Norman Veal Medal of the British Nuclear Medicine Society, the Queen's Anniversary Prize 2000 and the Lady Margaret MacLellan Prize which is given in recognition of outstanding contributions to medical science in Scotland. He was President of the European Federation of Organisations for Medical Physics from 2012 - 2014, and of the Institute of Physics and Engineering in Medicine from 1997-1999. He is a Fellow of the Royal Society of Edinburgh. In 2012 he was made an Officer of the Order of the British Empire for his services to healthcare science.

New website layout for Physica Medica - European Journal of Medical Physics (EJMP)

We are delighted to announce that the journal Physica Medica - European Journal of Medical Physics launched a new layout of its website.

The new homepage has a fresh and clean look and its structure allows to provide more figures and images taken from individual articles to promote current content. With the two-column design it is easier to find information as less scrolling is needed.

Please feel free to visit the new homepage at https://www.physicamedica.com/ and see what's up-to-date for Physica Medica - European Journal of Medical Physics.

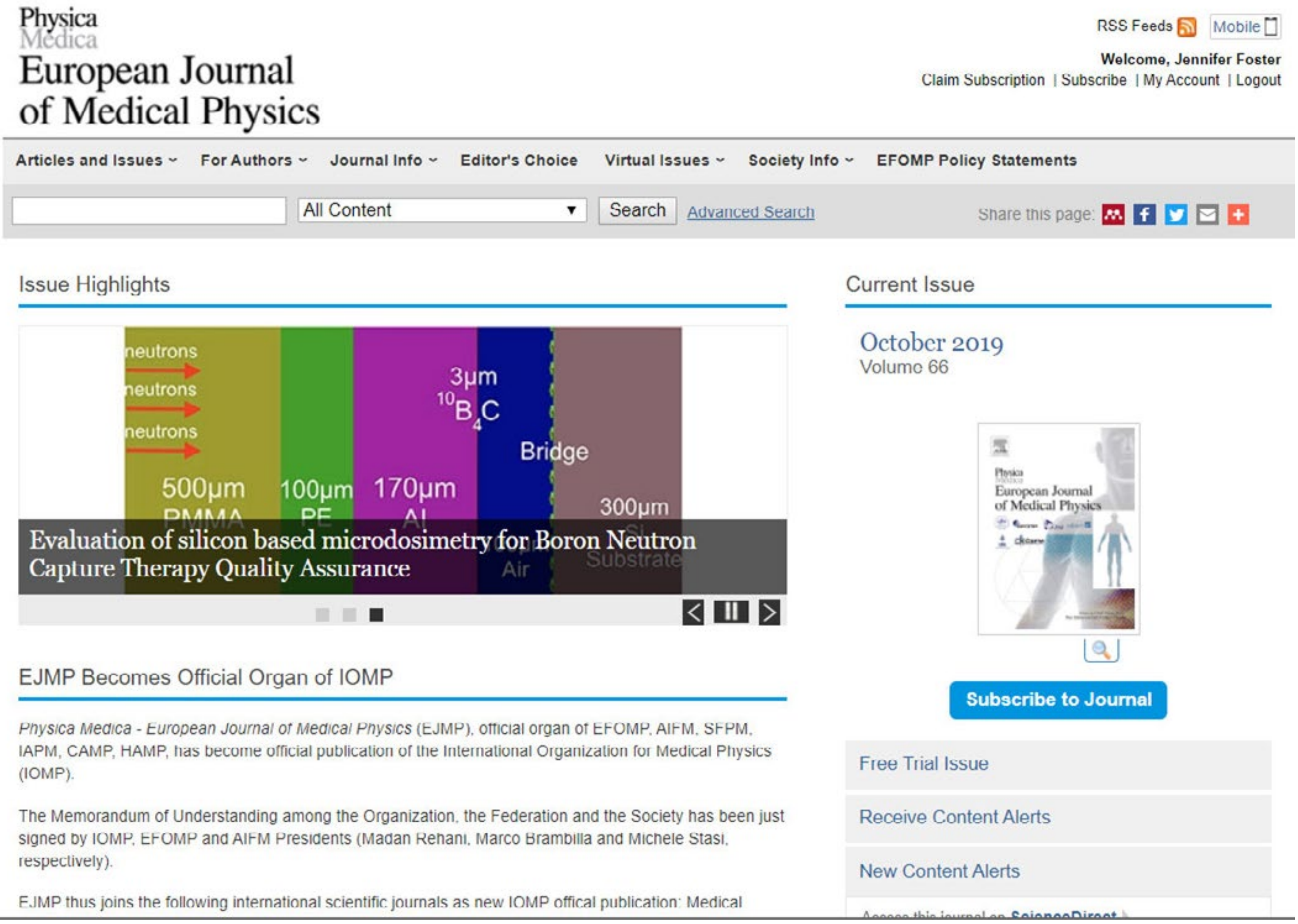


Fig. 1: Screenshot of the new Website of the EJMP

Enjoy browsing!

Dr. Silke Guddat

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Medical Physics in Greece – main activities 2018/2019

Celebrating 50 years of HAMP

The Hellenic Association of Medical Physicists (HAMP) was formed in March 1969. The association has a scientific, professional and educational orientation. Since then fifty years have passed, so this year, 2019, the HAMP commemorates its 50th anniversary, the "gold anniversary". This anniversary was celebrated at a special event held in Patras on the 16th of November. On this day Professor George Panayiotakis and Professor John Kalef-Ezra presented the great work across all areas of Medical Physics and Radiation Protection in Greece, which the late professors and pioneers Vasileios Proimos and Dimitrios Glaros have contributed to (Fig. 1).

Fig. 1: The Gold anniversary (photo HAMP)

The basic safety standards for protection against the dangers arising from exposure to ionising radiation and the new Radiation Protection Directives have been published by the Greek Government in accordance with the Euratom Council Directive 2013/59. HAMP made many comments on the implementation of the directive and participated in productive meetings with EEAE (Hellenic Atomic Energy Commission, GAEC). The final text was published in the official issue of the Greek Government (FEK 194/A/2018). In order to spread the details of the new legislation, a number of events took place around Greece, namely at Attikon University Hospital in Athens, September 2019, and at Papageorgiou Hospital in Thessaloniki, October 2019. Another event will take place in Patras, November 2019.

Each year HAMP organises a number of events and training activities in order to promote the application of Medical Physics and Radiation Protection and to raise awareness in all areas of ionising and non-ionising radiation.

At National and Kapodistrian University of Athens, November 2018, a workshop focusing on Lasers in Medicine and the safe use of laser devices was organised. Doctors specialised in Ophthalmology, General Surgery, Dermatology and Dentistry presented the specific laser apparatus they use, its benefits and the dedicated clinical use. Medical physicists explained the fundamental laser characteristics, the safe use and the precautions that should be taken to avoid possible dangerous exposure, the hazards caused by inappropriate use and the apparatus/meters needed to perform quality control of laser devices. More than 150 participants attended the event with great success. (Fig 2).

A similar event took place at Thessaloniki, October 2019. More than 70 physicists and doctors participated.

At Evagelismos Hospital in Athens, in January 2019, a seminar was organised focusing on Diagnostic Reference Levels as proposed by the ICRP Publication 135. Members of HAMP presented the basic characteristics of DRL's and the new proposals by the ICRP. They presented the current status of DRL's in Greece; the doses from conventional radiology, from interventional radiology and cardiology and the specific issue of pediatric levels.

Fig. 2: Lasers in Medicine and the safe use of laser devices workshop, November 2018 (photo HAMP)

After the seminar, an EFOMP-HAMP leadership meeting took place where the EFOMP President Dr Marco Brambilla discussed with the HAMP board areas of closer collaboration, such as the organisation of an EFOMP school edition in Athens 'Statistics in Medical Physics' and the new associate membership of HAMP in the European Journal of Medical Physics (EJMP).

HAMP is also involved in a number of social activities; the most recent one was our presence in the "Race for the Cure 2019", part of a global initiative to support women who have breast cancer. (Fig. 3).

Fig. 3: Race for the Cure, September 2019 (photo HAMP)

HAMP website

HAMP Facebook Page

Anastasios Siountas

Associate Professor in Medical Physics and Director of Medical Physics Lab, Medical School, Aristotelion University of Thessaloniki. His field of expertise is Radiation Protection in Nuclear Medicine and Radiology and on Measurements of Non-Ionising Radiation. He is a former HAMP president (2004-2008) and is currently the Public Affairs and Communication Chair.

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Ένωση Φυσικών Ιατρικής Ελλάδος

The Annual Meeting of the Serbian Association of Medical Physicists

Annual Meeting of the Serbian Society for Medical Physicists took place on 13th-15th September 2019, in Mećavnik, Mokra Gora Mountain.

More than 40 medical physicists form different centres participated in this meeting. The meeting offered lectures by Eduard Gershkevish - Small field Dosimetry: Challenges, Protocols and Detectors, and IAEA IMRT/VMAT dosimetry audit. Also different scientific sessions were offered such as diagnostic, dosimetry, nuclear medicine, radiation protection and radiotherapy during the two-day programme..

Fig. 1: Group Photo of the Serbian Society of Medical Physicists

Serbian medical physicists experienced a lot of different chalenges, due to installation of new machines in all centres. Medical physicists play a important role in those implementations, so they shared their experiences with other colleagues. Also, new techniques and their application were presented by centres who have recently commissioned IMRT/VMAT techniques. Each presentation was followed by a question and answer session.

During the meeting, physicists had the opportunity to visit Drina river for kayaking, on Saturday. There was also time to enjoy the beautiful nature while rowing. After lectures on Sunday, participants walked the 5km long 'school pathway' across a couple of mountains covered by forest, with our guides who took us to a local village house, where we had lunch. That was opportunty to speak with locals and appreciate their way of life.

Altogether, socializing and knowledge-sharing generated a lot of enthusiasm among participants.

Fig. 2: The Group in in their rowing outfits.

Ivan Gencel, MSc

Member of Communications & Publications

Ivan studied medical physics and is currently a Medical Physicist at Oncology Institute of Vojvodina. Ivan has also worked in the Military Medical Academy in the Radiological Protection department, and at a dosimetry laboratory.

Albanian Association of Medical Physics, (AAMP)

The "Albanian Association of Medical Physics - AAMP" (in Albanian "Shoqata Shqiptare e Fizikës Mjekësore") is a Non-Governmental (NGO) established in 2013 by a small group of medical physicists in Albania.

The main objectives of the Association are focused on:

- Creation of a network of experts and specialists in the field of medical physics with adequate professional preparation to serve in various health and therapeutic hospital centres;
- Offering continued training of membership and other interested persons in the country and abroad;
- Providing technical and professional assistance to institutions and individuals activive in the field of medical physics;
- Providing information to the population and the public in general about the effects of ionizing radiation by organizing periodic information activities and by publishing results from research and projects;
- Conducting studies and research in the field of medical physics and providing assistance to its members to participate in scientific research activities;
- Representing its membership in all activities which are carried out at national and international levels;
- Joining and creating cooperation networks with other organizations which have the same scopes and objectives.

The active members play a significant role in the main hospital centres and higher education institutions in Albania, including: University of Medicine, Tirana; University Medical Centre of Tirana „Mother Teresa", Department of Radioprotection; Hygeia Hospital, Department of Radiotherapy; Polytechnic University of Tirana, Faculty of Mathematics Engineering and Physics Engineering; University Medical Centre of Tirana „Mother Teresa", Department of Radiotherapy and Department of Radiosurgery; and in other hospitals in Albania.

The activity of the Association is based on its Statute and other legal acts in force in Albania. AAMP is led by the Board of administration and Chairman. From 2016, the Albanian Association of Medical Physics has been led by Dr. Niko Hyka, Chairman of AAMP.

— Since 2013 the Association has been active to promote and improve the Medical Physicist role in the field of Medicine. It has organized several activities in Albania and internationally with the aim to strengthen the role of the Association in the national and international context.

As a small organization, AAMP tried to accomplish its mission and objectives by organizing several activities such as seminars, workshops, consultations and other forms of communication with professionals and experts in this field. AAMP has increased the communication with the public about the risk of ionizing radiation and protective measures through publication on the official website (https://albamp.albmedtech.com), social networks (https://www.facebook.com/aamp.phys), brochures and media etc.. To strengthen the role of Medical Physicists in Albania, the Association has organized meetings with medical staff in diagnostic radiology and radiotherapy.

With the AAMP's contribution, a Master's programme in Medical Physics is provided by the Physics Department of the Polytechnic University of Tirana, under IAEA-TC-56, where active members of the Association are members of the academic staff.

In cooperation with higher education institutions and partners, the AAMP has organized several activities, training courses, workshops, conferences in the field of Medical Physics

The main activities with highest impact are:

- "Advanced Techniques in Medicine" held on 29 May 2013, in the Faculty of Mathematical Engineering and Physical Engineering, Polytechnic University of Tirana. In collaboration also with Hygeia Hospital Tirana;
- NTAM 2014, "New Technologies and Applications in Medicine" - First International Conference held on 7-8 November 2014 in Tirana, Albania with many invited speakers with high profile and background Medical Physics and application in medicine;
- The Institute for Medical Physics (IFMP) in association with the University of Elbasan "Aleksander Xhuvani" and the Albanian Association of Medical Physicists organized the International Medical Physics and Biomedical Engineering workshop in Albania was devoted to Medical Imaging for diagnosis with emphasis on Modern Ultrasound techniques and medical applications as well as Radiotherapy with emphasis on Brachytherapy. It was held in the University Alexander Xhuvani, Elbasan, Albania from 4 to 8 July 2016.
- The 14th International Conference "Standardization, Prototypes and Quality: A means of Balkan Countries' Collaboration", where the AAMP has been a partner of the event.

During these years, the individual contribution of the Chairman and Senior members in research activities, publications, projects etc., has been very important. Although a small organization, the contributions and experiences given during these years, will play a significant impact in the future role of Medical Physicists in Albania. At the international level we are aware that not enough has been done; although some fruitful collaborations with the Hellenic Association of Medical Physicists and the Institute for Medical Physics have taken place, there is certainly scope for increased activity. Despite the individual efforts of the members of the Association, cooperation at the international level should be increased.

In October 2019, the Albania Association of Medical Physics applied for membership of EFOMP; this will help to further consolidate the Association, increase the professionalism of its membership and increase opportunities for participation in international activities.

Niko Hyka

PhD in Medical Physics and Medical Image processing, Faculty of Medical Technical Sciences, University of Medicine, Tirana.

Dr. Niko Hyka is the Chairman of AAMP and Lecturer of Medical Physics at the University of Medicine, Tirana. The research activity of Mr. Hyka, is focused on Medical Physics, Medical Imaging and Medical Image Processing and Radiotherapy. He is a regular reviewer of "Physica Medica" and member of other organisations in Albania. He has a long experience in higher education, quality assurance and management. He is author of several published, articles, books and scientific presentations in national and international forums.

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International Day of Medical Physics in Croatia

Newly founded Croatian Medical Physics Association - CROMPA organised IDMP2019 Symposium "Medical Physics in Croatia" to celebrate International Day of Medical Physics and to enhance connections within the Croatian medical physics community. The Symposium was successfully held on Friday, 8. November 2019 at the Department of Physics, Faculty of Science, University of Zagreb, with more than 50 participants.

Fig. 1: The CROMPA Members

Hrvoje Hršak

PhD, medical physicist, CROMPA President, Department of Medical Physics, University Hospital Centre Zagreb

Hrvoje is a medical physicist at the Department of medical physics, University Hospital Centre Zagreb, Croatia. He earned his PhD in the field of small photon beam dosimetry. He is the founder and president of CROMPA. His main interests are radiosurgery, small beam dosimetry and medical physics professional matters.

International Day of Medical Physics in Serbia

Fig. 1: Celebration Athmosphere of the IDMP 2019 in Serbia

Being aware that the medical physics profession is demanding but also that there is a lack of medical physicists around the Globe, the Serbian Association of Medical Physicists dedicated this year's celebration to the future medical physicists. On November 7th 2019, at the Department of Physics, University of Novi Sad, we presented on the medical physicist's jobs and duties. The presentation included short, interesting stories from colleagues - personal development from student to medical physicist, videos from daily work, demonstration of small equipment items and demonstration of TPS. Physics students of all grades were warmly welcomed. The atmosphere from the celebration is captured in Figure 1.

A very successful quiz was organised, the t-shirts given as first place awards stated: 'Physicist - someone who solves the problem you didn't know you had in a way you don't understand' and 'I am physicist, because my Hogwarts letter never came'.

Borislava Petrovic

President of Serbian Association of of Medical Physicists

President and co-founder of the Serbian Association of Medical Physicists. Dr. Petrovic holds a PhD in the field of medical physics, and is working as chief of the medical physics group at the Radiotherapy Clinic, Institute of oncology Vojvodina, Sremska Kamenica. She is also the Associate Professor of Medical Physics at the University of Novi Sad, Faculty of Sciences, Department of Physics.

International Day of Medical Physics in Romania

Since 2013, alongside EFOMP and IOMP, The Romanian College of Medical Physicists (CFMR) together with the Department of Physics from the University of Oradea are celebrating IDMP via a symposium dedicated to the medical physics profession.

This year, as in all previous years, a large number of participants attended the event, including high school students, science teachers, medical physics students and professionals (Fig. 1-4). Throughout the years our focus was to promote medical physics as a field of science and a possible career path among the young generations, closely collaborating with science teachers. The poster and oral presentations presented at our symposium are all along the theme of IDMP, which this year concentrates on the multinational collaborations and the interdisciplinary nature of medical physics: "It's a medical physics world". Indeed, it is!

Fig. 1: Poster of the IDMP 2019 in Romania

Fig. 2 through 5: Impressions of the IDMP2019 in Romania

Loredana Marcu

President of the Romanian College of Medical Physicists (CFMR)

Loredana Marcu is Professor of Medical Physics at the University of Oradea, Romania and Adjunct Professor at School of Health Sciences, University of South Australia. She received her PhD in Medical Physics from the University of Adelaide. During her Australian experience, she has coordinated the LDR brachytherapy programme at the Royal Adelaide Hospital. She was also a TEAP preceptor supervising and coordinating the medical physics training and education of the junior physicists in South Australia. Her 20 years teaching experience at both Australian and Romanian universities has materialised in 14 books/book chapters published on physics, radiobiology and teaching methodologies. She has over 170 peer-reviewed publications and conference presentations. Her current research interests cover in silico modelling of tumour growth and response to treatment, targeted therapies, the radiobiology of head and neck cancer, and the risk of second cancer after radiotherapy. Dr. Marcu was the recipient of the "Boyce Worthley award 2006" given by the Australasian College of Physical Scientists and Engineers in Medicine for her achievements in the areas of radiobiology and medical physics.

International Day of Medical Physics at ICTP

The Students of the first year of the Masters of Advanced Studies in Medical Physics, jointly organised by the ICTP and Trieste University, celebrate the 2019 International Day of Medical Physics. Attending the course Brachytherapy exam were Professors Mauro Carrara (Istituto Tumori, Milan) and Francesco Ziglio (Ospedale S. Chiara, Trento). With this exam, the students have almost completed the 26 courses and exams of the Programme and are ready to begin the second year of supervised clinical training in one of the 21 hospitals in the network.

In the image, from left top row: Penabei Samafou (Chad), Ahmad Nawid Burhan (Afghanistan), Ashok Pokhrel (Nepal), Renato Padovani (ICTP), Shamirah Kirabo Nabankema (Uganda), Khady Sy (Senegal), Rosa Angelica Petit Sevilla (Venezuela), Lucia Arana Pena (Guatemala, Masters graduate), Edith Natalia Villegas Garcia (Nicaragua), Otieno Kapis (Kenya); bottom row from left: Mohammed Abujami (Palestine), Saba Muhammad Hussain (Pakistan), Rehema Ramadhan Mashaka (Tanzania), Suzie Radosic (Master's Secretary).

Fig. 1: The ICTP & Trieste University Masters of Advanced Studies in Medical Physics celebrating the IDMP 2019

Renato Padovani

Member of the EFOMP European Examination Board (EEB)

Coordinator of the Master of Advanced Studies in Medical Physics at ICTP (International Centre for Theoretical Physics, Trieste), jointly organised with the Trieste University, since 2014.

IAEA Technical meeting on Experience and Results in implementing the Safety in Radiation Oncology Reporting and Learning System (SAFRON)

The purpose of this Technical meeting, held in IAEA Vienna from 29th September to 2nd October 2019, was to review and evaluate SAFRON reporting, identify possible improvements to the system and examine ways to increase the profile and encourage the use of SAFRON. There were 27 participants from around the world including physicists, RTT's and Radiation Oncologists. A number of Professional Organisations were also represented. Brendan McClean represented EFOMP at the meeting. Debbie Gilley, from the Division of Radiation, Transport and Waste Safety in IAEA, who continues to be a strong advocate for SAFRON, was the scientific secretary for the event.

Debbie Gilley gave the introduction and history of SAFRON and made the important point that SAFRON and ROSEIS, while voluntary, are tools to enable facilities and countries to meet the requirements of the new BSS legislation. Meetings between IAEA and Regulators are planned to discuss how SAFRON might be further used. The importance of using incident and reporting systems to improve patient safety was clearly described. After setting the scene and identifying the objectives of the meeting, users from Hungary, Ireland, Latvia, New Zealand, Nigeria, Pakistan, Philippines, Spain and Switzerland gave short descriptions of their experiences with SAFRON. There was general support for SAFRON and a number of presenters showed how they evolved their in-house system to SAFRON. A common theme was the system proved very useful in terms of identifying areas for improvement. A number of possible reasons for suboptimal use for the system was discussed. Some users experienced technical difficulties in submitting reports but since members of the IAEA IT group were present, a number of these were followed up on. Language was identified as another potential problem as the system uses English at present. There is extensive use of drop down menus to minimise this issue, but the narrative section remains as English language only. There was a wide-ranging discussion on confidential versus anonymous submission of incidents and this is being considered further by IAEA. There was also the problem that SAFRON was not widely known as a reporting and incident learning system and discussion at the end of the meeting focused on ways to improve this. It was clear during the few days that IAEA were very open to feedback and suggestions for improvement.

Fig. 1: Some of the participants at the Technical Meeting in Vienna. Photo from Debbie Gilley

On the second day, the professional organisations presented. Jean Moran, Chair of the AAPM Therapy Committee, represented AAPM and presented information on the AAPM/ASTRO Radiation Oncology – Incident Learning System (RO-ILS). Mary Coffey represented ESTRO and presented the status and evolution of the Radiation Oncology Safety Education and Information System (ROSEIS). It was very interesting to compare ROSEIS and RO-ILS with SAFRON. An obvious question is why do we need three such systems? Debbie was able to provide a compelling reason for SAFRON in addition to the other two; to access ROSEIS or RO-ILS, a user has to become a member of either ESTRO or AAPM/ASTRO. IAEA wanted to develop a system that was independent of professional organisations and that was free to use, provided the facility was registered with the IAEA NUCLEUS system. There was a strong agreement from the participants that being able to search all three databases would provide a much better picture of what could go wrong for a particular situation. There have been discussions on how a user might be able to access at least some of the information across the three platforms and these discussions are ongoing. The EFOMP presentation emphasised the role of the Medical Physics Expert in the equipment commissioning process (Linacs, treatment planning systems etc), where errors made at this stage can potentially affect many patients. Physicists having access to the incident databases could help identify errors and near misses found elsewhere and help answer the question 'Can this happen here?'. The role of the MPE in the analysis of incidents and near misses is clearly described in the new BSS. In addition, EFOMP's key mission of promoting education and training programmes and objective of collaborating with other international organisations place the organisation in a good position to promote SAFRON and work closely with industry to identify risks associated with equipment. A good example is the document jointly developed by COCIR, EFOMP and ESTRO in collaboration with HERCA, which summarises residual risk as identified in the manufacturers risk management process. Integrating and promoting SAFRON in the numerous courses and workshops provided by EFOMP is a relatively straightforward way to increase the use of the system, and this process has already started. Pedro Ortiz Lopez represented IOMP and as one of the Principal authors of the IAEA Tecdoc 1685 (Application of the Risk Matrix Method to Radiotherapy) he was able to describe in detail the approach used for prospective risk assessment in radiotherapy. This was followed by a demonstration of the SEVRRA prospective risk assessment which is integrated into SAFRON and provides a powerful tool to help when introducing a new technology or treatment technique.

> ***— Overall, there was a positive interaction and enthusiasm to use incident and reporting systems. A number of suggestions were made to further enhance SAFRON and many at the meeting committed to continue to use and promote the system though different routes.***

Brendan McClean

EFOMP Science Committee Vice Chair (Jan 2020)

Brendan McClean is the Director of Physics for the St Luke's Radiation Oncology Network in Dublin, Ireland and Adjunct Professor at the School of Physics in University College Dublin. He is Director for the Irish national radiotherapy physics training programme and has extensive lecturing experience in radiotherapy physics, dose calculation and radiation protection both at home and as part of ESTRO, IAEA and EFOMP courses. His research interests include dose calculation and dosimetry.

ESTRO2020 Annual Meeting

The ESTRO 2020 conference takes place on 3-7 April 2020 in Messe Wien Exhibition & Congress Center, Vienna, Austria. This time the World Congress of Brachytherapy will take place adjacent to ESTRO 2020, from 2-4 April 2020 in the same venue as ESTRO 2020.

Every year at ESTRO, physicists and associated specialists gather together to hear and discuss the latest topics in radiation oncology. The conference will provide the opportunities for learning in teaching lectures, hearing about the state-of-the-art in symposia and updating on cutting-edge research in the proffered papers sessions. The commercial exhibition is the largest exhibition in radiation oncology in Europe with an increasing number of exhibitors year after year. Satellite symposia organised by the companies will present the latest commercial solutions. There is a separate area for start-up companies. On top of this there are ample opportunities for networking with colleagues, both new and old, from coffee breaks, meeting for lunch, poster viewing sessions and of course the highlight being the after-dinner party on the last night – always great fun!

At the conference there are two full tracks dedicated specifically to physics. In these tracks the teaching lectures include: do's and don'ts in automated treatment planning – optimising conditions and expectations; radiosurgery: potential and pitfalls; validation and commissioning AI contouring tools; dosimetry and QA for MRI linac. The state-of-the-art symposia will cover topics such as: where automation can and cannot help the medical physicist; the future of medical physics; surface guided radiotherapy; audits for advanced radiotherapy techniques and a joint EFOMP-ESTRO symposium on artificial intelligence and image quality. There will also be debates, on the topics of "Is there a future of adaptive radiotherapy without MR-Linac?" and "Whether radiomics will improve predictive models in radiotherapy."

Of course, no conference is complete without a good number of sessions dedicated to the latest research in the form of proffered papers. This year we had more than 700 physics abstracts submitted to the conference.

Alongside the physics track is the interdisciplinary track which incorporates many physics topics and the implementation into the clinic. This year the highlights include the use of artificial intelligence in contouring, MR-guided radiotherapy, GRID and FLASH radiotherapy.

The young track is also highly recommended for anyone who wants to discuss or get advice on topics such as novel radiotherapy techniques/treatments and how to successfully communicate in professional life and within the team.

Finally, we extend our warmest invitation to all physicists to attend the Physics Members Assembly where you can find out about the activities of the ESTRO physics committee and discuss your suggestions and ideas for these activities going forward.

For more information go to: https://www.estro.org/Congresses/ESTRO-2020/ESTRO-2020

Dr. Eduard Gershkevitsh

Chair of the ESTRO2020 physics tracks
Head of Medical Physics Services at North Estonia Medical Centre, Tallinn, Estonia

Dr. Eduard Gershkevitsh is a medical physics expert working at the North Estonia Medical Centre. His main focus areas are radiotherapy equipment commissioning, QA, dosimetry and audits. He is also taking part in numerous teaching activities. He is a member of ESTRO Physics Committee.

ESMRMB 2019

Fig. 1: The Conference Banner

The Annual Meeting of the European Society for Magnetic Resonance in Medicine and Biology took place this year in Rotterdam/NL from 3rd to 5th October 2019. ESMRMB aims to promote the development and practical application of magnetic resonance in medicine and biology and to foster collaboration between various disciplines within the field of MR.

The 36th meeting, organised around the three major themes of machine learning, Gadolinium-free imaging and efficient MRI, was a great success, with over 850 attendees. For the first time, two pre-congress events were organised: a meeting which focused on pre-clinical MRI as well as an ESMRMB–GREC workshop, discussing latest developments around Gadolinium retention. Both were great additions to the congress programme and proved very popular. ESMRMB was happy to welcome attendees from 38 countries across Europe and worldwide. We were delighted that around 280 of our attendees were MR Physicists.

Fig. 2: The Conference hall the ESMRMB is taking place in.

Fig. 3: The Exibition Area of the ESMRMB 2019

The ESMRMB meeting is well-known for the annual round table discussion and debate. The topic of this year's round table discussion was how Europe can lead in machine learning, with a strong focus on the privacy regulations of the GDPR. It became clear that at the moment the lack of jurisdiction about what level of anonymity an MR image has and how detailed the informed consent should be, are the important limiting factors. It seems that most people interpret the EU-regulations more strictly than necessary or intended, but without jurisdiction nobody dares to take the risk of fines. From the representatives of a large and medium-sized healthcare company, it was confirmed that access to data with proper informed consent is a limiting factor at the moment.

During the lively debate it was discussed whether PET-MRI is waste of money or a more efficient imaging modality. The debate focused on the reliability of attenuation correction by MRI instead of CT, but in the end the opinion of the audience was split: too close to call whether the audience supported the proponent or the opponent. This can partly be attributed to the very qualified debaters…

— Finally, the ESMRMB finds it very important to promote junior researchers. To this end, special sessions were organized, partly in collaboration with the ISMRM Benelux, on career development, how to start a spin-off company, and are junior members now officially included in the board of the society as well as in the organization committee.

Preparations are already in full swing for ESMRMB 2020 which will be held in Barcelona from 1st to 3rd October, 2020. The 2020 Congress Planning Committee chaired by Prof. Andrea Rockall (London/UK), met in Rotterdam and ESMRMB 2020 looks set to be another fantastic meeting. Keep an eye on the ESMRMB website for more information about abstract submission and registration dates. We hope to see you there!

Matthias van Osch

Matthias van Osch is a professor in Radiology with a special focus on cerebrovascular imaging within the Leiden University Medical Center, Leiden, The Netherlands. He served as chair of the scientific programme committee of the ESMRMB 2019.

Just specialized in Medical Physics!

I have successfully concluded the three years of the post-graduate School of Medical Physics at Milan University, Italy. I discussed my speciality diploma in Medical Physics on 12 November 2019, with a final vote of 70/70 cum laude, in a day where ten new medical physics specialists (MPE level 8) (Francesca Calderoni, Roberta Castriconi, Eduardo D'ippolito, Pasqualina Gallo, Giuseppe Magro, Lisa Milan, Stefania Nici, Francesco Padelli, Chiara Romanò, Michele Signoriello) were promoted at Milan University (Figure 1).

I have conducted my thesis work in the field of radiotherapy at the San Raffaele Scientific Institute, Milan. The aim of the work was to extend the "Knowledge-based" automatic planning approach to treatment delivered with Helical-Tomotherapy, developing a dedicated automated planning workflow.

Fig. 1: The ceremony of Medical Physics Specialization at University of Milan, Italy, on 12 Nov. 2019.

The advent of intensity-modulated-radiotherapy (IMRT) has given the opportunity to maximize cancer control while minimizing toxicity to the surrounding normal tissues. However, the increasing complexity of radiotherapy treatment planning has made it challenging to efficiently generate consistent, high-quality treatment plans. Moreover, the final result of the optimization process is strongly planner-dependent. In order to reduce both the inter-operator variability and to reduce the time for planning, in recent years automatic planning systems were introduced and investigated. The application of machine-learning techniques to planning optimization led to the development of the so-called knowledge-based (KB) optimization approach. Existing clinical treatment plans may be modelled to individually estimate the dosimetric features expected in new patients, taking into account the anatomical and morphological characteristics of each individual patient. RapidPlan (RP) is a commercially-available KB planning tool (Varian Medical System, Inc., Palo Alto, CA, USA), implemented into the Eclipse system. In the present work this KB-planning approach was extended to another environment different from the Varian system, in particular to treatment delivered with the Helical-Tomotherapy (HTT) system, in order to fully automate the planning workflow in the case of hypofractionated simultaneous integrated boost (SIB) for high-risk prostate cancer, including pelvic nodes irradiation.

Our clinical protocol consists of delivering 74.2 Gy to prostate and proximal seminal vesicles (PTVhigh), 65.6 Gy to the cranial portion of seminal vesicles (PTVint) and 51.8 Gy to the pelvic lymph nodes (PTVLN) in 28 fractions. 102 HTT clinical plans were selected to train a KB-model using the RP- tool. RP is configured to model plans delivered with VMAT - RapidArc (RA) plans. Hence, all plans were exported from the HTT-TPS to Eclipse and linked to virtual RA-plans. The resulting KB-model was interactively fine-tuned in terms of statistical DVH estimation and optimized template for the optimization, aiming at maximizing its robustness. Then, an internal (20 patients inside the model) and an external validation (30 new patients) were performed to assess the performance of the model. All automatic HTT-plans (KB-TP) were compared against the original plans (TP) in terms of OARs/PTVs dose-volume parameters. Wilcoxon-tests were performed to assess statistically significant differences ($p < 0.05$). To automate the entire HTT-planning workflow, the individually-optimized KB-based templates are converted in HTT-like template and sent automatically to the HTT-TPS through scripting. The individual template is then associated to the patient in the HTT-TPS and the full dose calculation is set after 300 iterations, without any additional planner intervention (Figure 2).

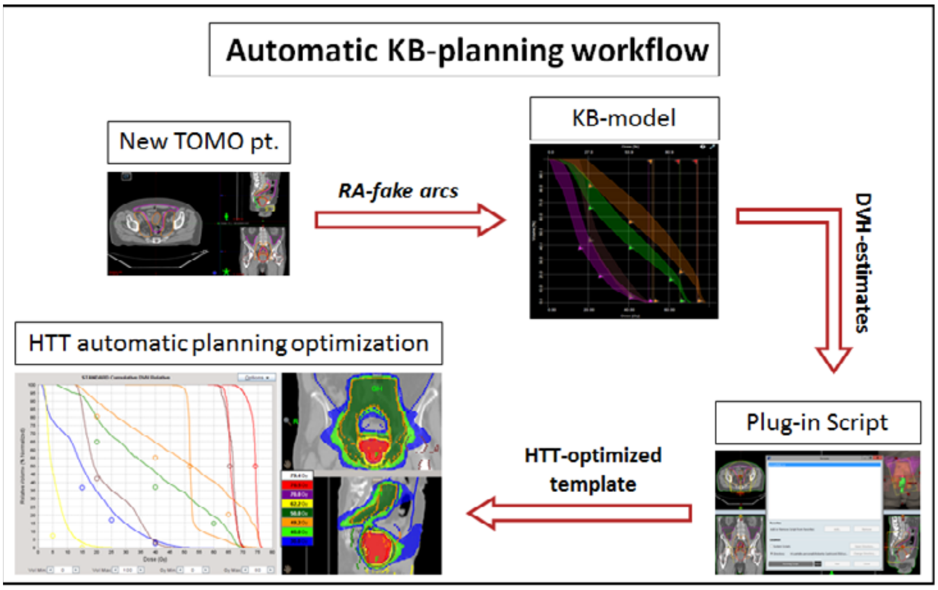


Fig. 2: The KB-based HTT automatic planning workflow

KB-TP plans were generally better than or equivalent to TP plans, in both validation cohorts (Figure 3). PTVs coverage were comparable for the internal sets, meanwhile PTVhigh and PTVint coverages were slightly improved for the external ones. Moreover, a significant improvement in PTVs and OVERLAP (between rectum and PTVhigh) homogeneity were observed for both set. OARs sparing for KB-TP was slightly improved, more evidently in the external validation group. Of note, V20Gy, V40Gy and Dmax for the bladder were significantly better in KB-TP plans, V20Gy and Dmean for the bowel, as well as for V68Gy and Dmax of the rectum.

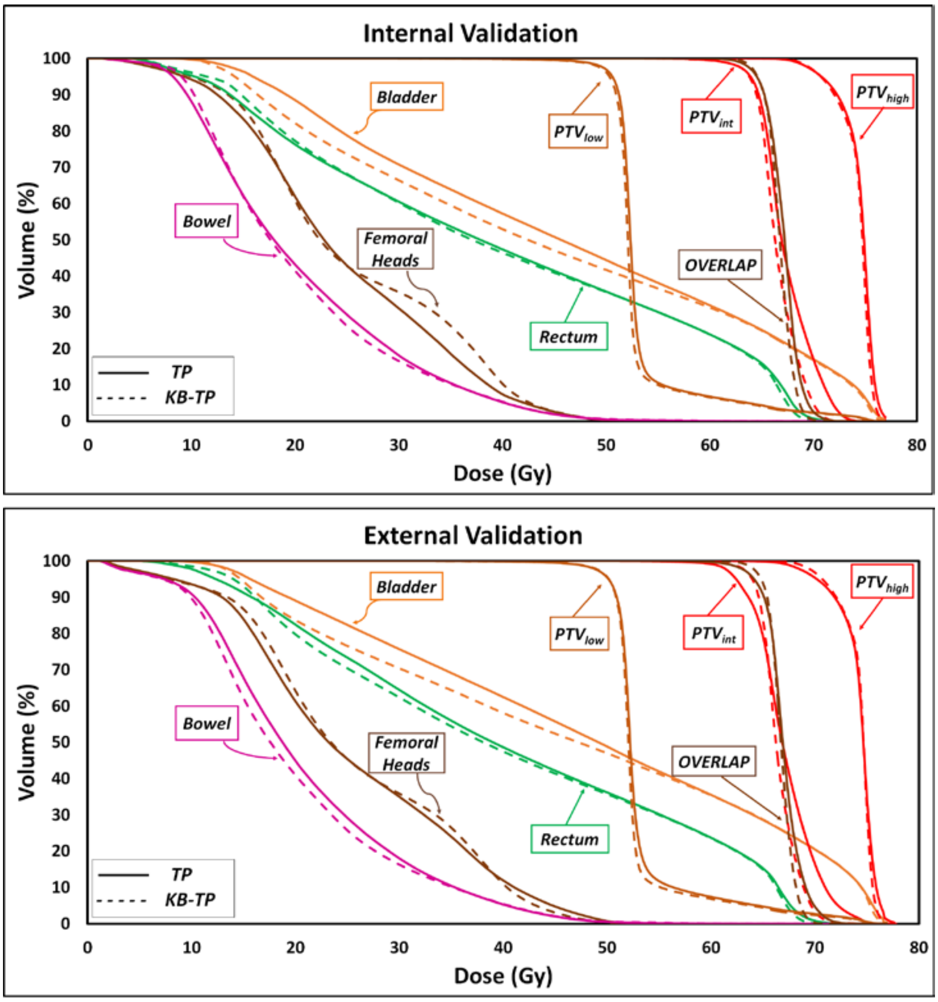


Fig. 3: The KB-based HTT automatic planning workflow

We demonstrated the feasibility of the clinical implementation of the KB-approach to treatments delivered with HTT. For the first time to our knowledge, fully automatic planning workflow was successfully implemented for HTT planning optimization. The KB-based planning approach was able to generate high-quality automatic HTT plans, without any intervention of the planner. We expect that the use of our KB-approach in clinical routine allows to reduce the planner time spent for the optimization phase and to improve the plan homogeneity between operators avoiding sub-optimal plans.

Roberta Castriconi

Roberta Castriconi (castriconi.roberta@hsr.it) is 29 years old. In 2013 she earned her B.Sc. degree in Physics, discussing a thesis on phase contrast mammography, and in 2016 her M.Sc. degree in Physics, at Federico II University, Naples, Italy, with a thesis on radiochromic film dosimetry for hadron therapy. Now, she achieves the title of Medical Physicist Expert, after the three year post-graduate School of Medical Physics at Milan Univeristy, Italy, with a thesis on Knowledge-based automatic planning in radiotherapy field conducted at the San Raffaele Scientific Institute, Milan. She is highly motivated and optimistic about her future career as a qualified medical physicist. Moreover, she is a swing dancer in particular lindy hop, shag, charleston, solo jazz and balboa. She loves music and enjoys all sports, in particular horse riding, bicycle riding and skiing. She loves travel, camping holidays and music festivals.

Data Analysis with Python for Medical Physicists

What is the challenge for the modern medical physicist?

Medical Physics clinical work is increasingly data driven. Most imaging modalities generate data which is automatically recorded by dose monitoring platforms. This makes large datasets available to us for analysis. How do we perform statistical analysis on these datasets beyond what is offered by the dose monitoring platform itself?

Medical physics QA reports exist typically as multiple excel documents. Physicists periodically collate this data for trends and inter-system analysis. Done manually, this is time consuming and error prone. How can we facilitate the collation of this data and automate tasks to minimise errors and improve consistency?

In Nuclear Medicine, effective half-life determination is a routine task. Curve-fitting is required on a sparse number of data points, with a determination of the best curve-fit. How can we automate the process and generate plots that can be saved in the patient's file?

Where does programming fit in?

Programming gives us an appropriate tool to address these questions. While spreadsheets may be de-facto tools, they require significant manual intervention, especially when multiple analyses and hypotheses need to be answered from the same dataset.

A purpose-built software would collect, clean and analyse data, preparing all the separate views and results. Knowledge of a general purpose programming language can allow for easy data extraction from separate spreadsheet and text documents to curate and store them in databases for future use. It gives us the understanding to query these databases and perform comparative studies or time series analyses.

Good programming practices help us focus on software tools containing centralised operational logic. This contrasts with spreadsheet formulas where operational logic is copied to each spreadsheet document - making formula validation more difficult.

Why Python?

SPSS and R are robust and mature tools used for statistical analysis of potentially large datasets. Excel provides a platform for collection, analysis, and presentation of results. It is flexible, versatile and ideal for prototype and concept development. MATLAB has excellent signal and image processing libraries out of the box.

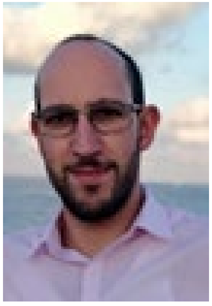
Python is not a replacement for these tools. However, generally, Python is capable of performing everything that can be done with the above tools. The strengths of Python are that it is free, removing cost or licensing barriers; that the community offering support is large; and finally above all else, Python can be used to solve problems from start (say, interacting with a database) to finish (say, web server deployment).

Python was chosen for the advantages mentioned above; because it was ranked top programming language for 2018 and 2019; because it boasts a wide variety of libraries for scientific programming, machine learning, computer vision, and Medical Physics specific tools for working with DICOM files (PyDICOM) and quality assurance in radiotherapy (PyLinac).

Eric Pace

Secretary EFOMP Education and Training committee

Eric Pace is a diagnostic and interventional radiology medical physics expert currently working at Mater Dei hospital. Eric holds a degree in Physics and Computer Science and a Masters in Medical Physics. He is interested in radiation dose and image quality optimisation, automation and data analysis tools with Python.



Sam Agius

Secretary EFOMP Professional Committee

Sam is a medical physicist at Mater Dei Hospital and Sir Anthony Mamo Oncology Centre. He is specialised in diagnostic and therapeutic nuclear medicine. Sam read a degree in Mathematics and Physics and successfully achieved Master of Science in Medical Physics at University of Malta. Sam was acting treasurer for MAMP between January 2018 and November 2018. Currently, he is the president elect of the Association for the term 2019 – 2020. Sam is particularly interested in dosimetry and radiation protection.

Python for Medical Physicists
A course by the Malta Association of Medical Physicists

The Malta Association of Medical Physicists (MAMP) is organising a course to encourage physicists to be comfortable with programming in Python for daily clinical tasks and data analysis. This course will be held between 28th and 30th May, 2020 in Malta.

This course is aimed at medical physicists and trainees in all specialities of Medical Physics, having no or limited background in programming, or looking to refresh their programming skills. The purpose is to teach how to work with external data sources and use tools to read unstructured data. The topics addressed will be the following:

- Read and write CSV, EXCEL, JSON files
- Structuring data for storage and retrieval
- Clean, filter, process and plot columnar data. Subgrouping with specific statistics performed on each subgroup
- Plot data as line, bar, box and scatter plots.
- Use PyDICOM to work with DICOM files

For more information, please visit www.mamp.org.mt or contact us on mamp.malta@gmail.com

The role of a physicist in a clinical trial organisation

Since 2016 I have been the Radiotherapy Quality Assurance (RTQA) Manager at the European Organisation for the Research and Treatment of Cancer (EORTC), a non-profit cancer research organisation. EORTC is a unique, independent, multi-tumour, and multidisciplinary research organisation, comprising a network of more than 5300 researchers from around the world and 220 full-time staff at the headquarters in Brussels, Belgium. Data quality is the top priority for EORTC, and a RTQA programme has been active within the EORTC Radiation Oncology Group (ROG) since the mid '80s. Severe corruption of the trial endpoints can result from the poor quality of planning and/or delineation when the trial constraints and delineation coverage are not adhered to.

I am the only physicist in the building, thus occupying a unique position in a unique institution, and I work with medical physicists from across and beyond Europe.

There is a growing realisation across the medical physics community and radiation oncology at large that medical physicists can contribute significantly to clinical trials, outside of mere QA, but it is not always clear how exactly one can become involved. I will try to answer that question, if not in full; at least I will try giving the reader a few helpful pointers.

A physicist at EORTC Headquarters

Before joining the EORTC HQ I worked in both industry and academia. I was mainly focused on coding: camera drivers, data acquisition simulation, image reconstruction, analysis of NM and (TOF) PET images. My desk life was punctuated by the odd phantom acquisition session, the mise en scène of which will be familiar to many readers: an exhausting, non-stop, caffeine- and chocolate-fuelled weekend of data acquisition followed by months of analysis. Joining the EORTC to work on clinical trials has been a complete inversion: a trial is a resistance affair, a long and carefully planned ultramarathon of data collection followed by a comparatively quick predefined analysis. Working behind the scenes of a trial forces one to get acquainted with aspects of clinical research usually hidden to investigators. Life at HQ as the only physicist and only on-site "RT person" can be hectic but also enormously stimulating.

Surprisingly, many of my contributions to trials are not, strictly speaking, about the physics of RT: there is a bit of regulatory affairs, some study design aspects, patient management and a lot of document editing and revision. It all happens side by side with some of the most talented cancer research professionals in the field both in and outside of EORTC HQ. The colleagues from the EORTC network that I work with are all part of a pool of RTQA experts. The team meets twice a year during the EORTC Radiation Oncology Group (ROG) meetings, and once more for the annual EORTC RTQA meeting. The network helps me keep a connection with the clinical world and "real life" patient treatment, which starts to feel a bit distant after working at HQ for more than 3 years.

How can medical physicists become involved in RTQA for clinical trials?

The purpose of trial RTQA could be summarized with the three words "keep variations down", another inversion compared to the clinic: **hospital** RTQA is part of a global safety management strategy with a focus on patient safety; **trial** RTQA is part of a global strategy oriented at building an unbiased dataset to ensure all patients are treated with a similar quality standard. Variations in the way patients are treated can work their way downstream, potentially causing variations in outcome related to the trial question and corrupting the trial endpoints. [1-3]

As a consequence, the first and easiest way for a physicist to get involved is by contributing to the trial design and helping to write the trial protocol: clear instructions and essential mandates can help enormously towards compliance. At EORTC, at least one radiation oncologist and one medical physicist from the RTQA team, who have not participated in writing the trial protocol, will review the text with fresh eyes and provide comments on clarity and content to the study team. Protocol QA is the first line of defence against protocol deviations, and the most effective: a lot of work in the beginning can really pay off in the long term.

The bulk of the work is however in trial **patient QA**, which is another way a physicist can get involved in a trial. Patient plan QA is essentially a (binding) second evaluation on the RT plans of patients. These could be actual recruited patient or a fully anonymous patient case, identical for all participants, used as a benchmark tool.

The analysis of patient cases and benchmark cases provides a trial-wide snapshot of the planning landscape in research institutions. The plans and data generated by RTQA review are stored alongside all other trial data; they can be used for the main analysis or processed in parallel to produce secondary studies from the trial data or relate outcomes to dose-volume parameters. Plan review for RTQA is an effective exercise for our experts, who end up reviewing 2/3 cases per week, gaining even more experience and benefitting their patients in the clinic too. With the exception of myself – I am an employee of EORTC HQ - everyone else in the RTQA team is a volunteer of the EORTC ROG. Our experts represent the scientific backbone of our RTQA activities. Everything we do at HQ happens because of their contribution.

The collected plans are only part of a larger study dataset which includes clinical baseline and follow-up data, all of which have been cleaned and QA'd by EORTC data managers. Such data can be extremely useful and, at certain conditions, **it is free to request and use for other research [5].** It has, for example, been used in the past to build/validate anatomical models for automated planning, or NTCP models. The RTQA dataset of the EORTC 1219-ROG-HNCG study has been used by Jim Tol and colleagues [4] to validate a local model for knowledge based planning. They showed how their model could be used to QA trial patients to reduce dose to OARs by 3 to 6 Gy, even up to 9 Gy in some cases.

Many of such ancillary research projects originate within EORTC and actively involve physicists from our network. These are tremendous opportunities for researchers and students to access high quality RT plans and the associate clinical data. One of our biggest research project, for example, involves a team of 8 physicians and physicists from Spain, Italy, The Netherlands, Portugal and Israel working on a study quantifying inter-observer variability in glioblastoma patients, and how it translates to clinical outcome. It is all very instructive and we have a fair amount of fun.

The experience of a trial physicist

To provide readers with a view of what trial QA means I reached out to our physicists. Physicists in the EORTC ROG are a minority compared to radiation oncologists, but they are a particularly active bunch. I asked Raquel Bar-Deroma, a physicist at Rambam Medical Center in Israel, about the early days of RTQA. Prior to joining the EORTC RTQA team, Raquel was working at QART Rhode Island, US: "Plan review was performed by checking printed isodose distributions in one plane, when available, but usually it was only MU calculations. Very simple 2D planning. At that time ICRU 50 was being drafted. I cannot remember when I started to review for EORTC, but I was already working at my hospital when we participated in the big Boost/no Boost breast study (EORTC 22881-10882). Still, simple 2D."

Moving from 2D to 3D, to volume based delineation and from there to inverse planning introduced "more parameters to be taken into account in design and QA processes. We need to be more specific on every parameter that may influence the results of the study, QA must be more strict and the knowledge that a clinical medical physicist gains in their day to day work is important when reviewing these complicated cases."

What's next?

Today, RTQA plan review runs the risk of becoming a little more than a checklist of dose-volume values to compare with protocol mandated limits. The EORTC strategy for the future of RTQA is based on the conviction that we must make better and fuller use of the wealth of information available in trial patient plans. We are experimenting with different ways to use such information to produce meaningful feedback to participating institutions beyond a simple green/yellow/red light, to help institutions improve their technique and ultimately for the benefit of patients even outside of trials. This shift from Quality **Assurance** to Quality **Improvement** will happen by implementing two key measures.

The first is **personalized plan QA**: so far we have been simply imposing dose constraints for OARs and leaving the decision on whether to compromise on PTV coverage for OAR sparing to the subjective perception of risk by the planning team. We instead imagine a scenario where we provide individual estimation of complication probability and apply a risk threshold as a criterion to make a choice on OAR sparing, thus eliminating some subjectivity in the process and decreasing variability.

To achieve this, we are working to incorporate NTCP evaluation on individual plans in the RTQA process of our trials. We are also building a set of custom tools to produce reports comparing individual patient DVHs with trial population DVH distributions.

The second step is using knowledge-based or AI-based planning to provide an estimation of achievable quality to the participating institutions and help them achieve the best plan, given as input the trial objectives. We aim at implementing anatomical models for patient classes in our trials, using them to generate "optimal" plans to be compared with the submitted plans.

All of this is happening thanks to the time, commitment and scientific guidance of the EORTC RTQA team, which is open to anyone willing to participate. I do hope this article will inspire some of the readers to reach out and become more involved in clinical trials. In an ever evolving, technology-based field, the voice and knowledge of the physicist is needed now more than ever to design meaningful radiotherapy trials.

References:

1. Peters, Lester J., et al. "Critical impact of radiotherapy protocol compliance and quality in the treatment of advanced head and neck cancer: results from TROG 02.02." Journal of clinical oncology 28.18 (2010): 2996-3001.

2. Abrams, Ross A., et al. "Failure to adhere to protocol specified radiation therapy guidelines was associated with decreased survival in RTOG 9704—a phase III trial of adjuvant chemotherapy and chemoradiotherapy for patients with resected adenocarcinoma of the pancreas." International Journal of Radiation Oncology* Biology* Physics 82.2 (2012): 809-816.

3. Weber, Damien C., et al. "QA makes a clinical trial stronger: evidence-based medicine in radiation therapy." Radiotherapy and Oncology 105.1 (2012): 4-8.

4. Tol, Jim P., et al. "Analysis of EORTC-1219-DAHANCA-29 trial plans demonstrates the potential of knowledge-based planning to provide patient-specific treatment plan quality assurance." Radiotherapy and Oncology 130 (2019): 75-81.

5. EORTC Data Sharing Policy POL008 http://www.eortc.org/app/uploads/2018/02/pol008.pdf

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The International Organization for Medical Physics (IOMP) strategic plan 2018-2021: A review by a group of young leaders.

The IOMP recently published its strategic plan for 2018-2021(1). In this strategic plan the IOMP sets out an updated mission statement, vision and strategic agenda. In this article, we will review the IOMP strategic plan and provide suggestions for further development.

We are a group of medical physicists who met whilst completing the EFOMP-EUTEMPE MPE01 Leadership in Medical Physics, development of the profession and the challenges for the MPE module in Prague in February 2019. This module includes learning about strategic planning. Strategic planning is not usually something that we are taught whilst completing a degree in physics or physical sciences. The EFOMP-EUTEMPE MPE01 module therefore aims to help medical physicists acquire the knowledge, skills, competences and attitudes necessary to exercise a strategic leadership role within the profession. The course introduces strategic planning using the SWOT (also sometimes known as 'TOWS') methodology, which is a standard method used for position audits and strategic planning (2 - 4). It is essential in any strategic plan to carry out an audit of SWOT themes (Strengths, Weaknesses, Opportunities, Threats). By creating a SWOT matrix, you can clearly identify the strengths and opportunities that will help you achieve your vision. The weaknesses and threats also need to be documented and addressed as they could prevent you from achieving your vision.

The IOMP represents about 25,000 medical physicists worldwide and 86 national member organisations (NMOs). Strategic Planning for an organisation like IOMP is vital. A strategic plan should outline a set of actions, measureable milestones and strategies to take the organisation from its present state to the desired state, where it would like to be in the future. It is essential that our international organisation takes ownership of and plans for the future and takes action to advance our relatively small healthcare profession, especially in developing countries. We are delighted that the IOMP has developed a strategic plan, but is it adequate for what we expect of an international organisation representing medical physicists globally?

The first step in strategic planning is to define the mission of your enterprise. The IOMP has previously defined its mission as: "To advance medical physics practice worldwide by disseminating scientific and technical information, fostering the educational and professional development of medical physicists, and promoting the highest quality medical services for patients."(5) The strategic plan provides an updated mission statement which is "To connect with international organizations and medical physicists globally for enhancing patient benefit". In this updated mission statement the IOMP recognizes the importance of linkages with international organizations (e.g. WHO, IAEA) for the advancement of the profession globally. It also emphasizes the importance of producing strong international networking of medical physicists. Rightly so it includes the ultimate mission which is to help medical physicists produce high-quality services for patients.

A vision statement represents the conceivable ideal future state of the organization that the IOMP is aspiring to achieve with its activities. The vision statement in the present strategic plan states: "To enhance the professional skills of medical physicists and healthcare professionals." Although we recognise the ambition of the IOMP, this is not a vision per definition, but more a component of the mission. Recently, the Canadian Organization of Medical Physics (COMP) developed a strategic plan in which a SWOT matrix was used which proved a very useful tool to develop a strategy for their organization (6). In developing their strategic plan the COMP involved their stakeholders in a strategy formulation session and engaged with their members through an information gathering questionnaire and member surveys. Four key strategic priorities have been identified and for each priority, specific measurable tactics have been determined. Each year, the COMP publishes an update on their progress on their website for members. We consider this is an example of excellent leadership qualities and strategic planning skills. One can compare this vision statement to that of the Canadian association which reads as follows "to be the recognized leader and primary resource for medical physics in Canada". This is in our opinion closer to the definition of a vision statement for an organization. Perhaps a more suitable vision statement for the IOMP would be something like: "To be recognized by medical physicists worldwide and international healthcare stakeholders as the global leader for the medical physics profession". A strategic plan is defined as a detailed plan of action to achieve the vision; therefore if the vision is not clear the strategic plan will not have a definite direction. In this regard, the IOMP strategic plan appears to be missing a clearly defined organizational vision, and without a clearly defined vision it is more difficult to develop a strategic action plan.

One should note that there is no indication that a SWOT position audit and a gap analysis was carried out prior to the formulation of the plan. A SWOT position audit results in an objective assessment of the current state of the organization with respect to the vision. This should be followed by a gap analysis that seeks to reveal any gaps between the current actual state of the organization and the future desired state of the organization as described in the vision. A reference to a SWOT and gap analysis seems to be missing from the IOMP strategic plan. A good strategic plan should have a clearly defined set of objectives to show how one intends to bridge the gap from the current position to the desired vision.

The IOMP has listed five strategic agendas in their plan but they have not stated how they plan on meeting these agendas. For example, the first strategic agenda of the IOMP plan is "to interact with international organizations to enhance the visibility of recognition of medical physics in clinical settings". Many countries have no formal recognition of the medical physics profession and therefore we welcome this statement by the IOMP, but specific actions on how IOMP plans to achieve this strategic agenda are needed. Another agenda is "to meaningfully connect and maintain links with medical physicists globally" but there is no detail on how IOMP plans to achieve this, or measure when the agenda or goal is reached. Perhaps one should consider stronger use of social media to connect with their members or follow the example set by the current President of EFOMP of holding leadership meetings with NMOs. With a large number of NMOs this could prove difficult but with advances in digital communication platforms there should be opportunities for each NMO to become more involved and connected with the IOMP. If the NMOs are more involved in the development of the strategic plan, the IOMP is more likely to be successful in achieving its vision and agenda.

Coming back to our question earlier, "is this plan what we expect of an international organisation representing medical physicists globally?" We feel that further work is necessary to turn the document published by the IOMP in their June 2019 newsletter into a full strategic plan. We suggest the IOMP engage more with their NMOs and include them in drafting a more detailed strategic plan. In 2006, the IOMP did carry out a consultation in drafting a strategic plan for the IOMP for the time period 2006-2012. IOMP did this by sharing its draft strategy planning document plan with NMOs and asking each NMO to return their feedback in the form of a questionnaire. We are delighted to say the draft plan included a SWOT analysis. We are unsure if this strategy was ever fully developed or published. We strongly encourage the IOMP to consider developing a full strategic plan which includes clearly defined and measurable goals for the future development of the medical physics profession worldwide and how this will lead to better care for patients. We are sure that IOMP will find many highly motivated people who would be willing to contribute to the development of the profession.

We are pleased to read the IOMP President's message in the most recent IOMP newsletter (7) where he details a number of initiatives the IOMP has been undertaking which shows they are engaging with their stakeholders. Some initiatives include holding meetings with international medical professional societies at the recent International Conference of Medical Physics (ICMP2019) and teaching medical physics to medical and pre-medical students. The IOMP is also planning some joint webinars with international radiology societies. It appears the IOMP are working hard to implementing its strategic plan.

References:

(1) IOMP Newsletter, Vol. 1, No. 2, June 2019 https://www.iomp.org/wp-content/uploads/2019/05/IOMP-Strategic-Plan-2018-2021.pdf

(2) Weihrich H. The TOWS matrix-a tool for situational analysis. Long Range Planning 1982;15 (2):54-66

(3) Caruana, C. J., Wasilewska-Radwanska, M., Aurengo, A., Dendy, P. P., Karenauskaite, V., Malisan, M. R.,...Wucherer, M. A comprehensive SWOT audit of the role of the biomedical physicist in the education of healthcare professionals in Europe. September 2009 Physica Medica 26(2):98-110

(4) Caruana, C. J., Wasilewska-Radwanska, M., Aurengo, A., Dendy, P. P., Karenauskaite, V., Malisan, M. R.,... Wucherer, M. (2011). A strategic development model for the role of the biomedical physicist in the education of healthcare professionals in Europe. Physica Medica, 28(4), 307-318.

(5) Mission Statement of IOMP https://www.iomp.org/organisation/

(6) Canadian Organization of Medical Physicists (COMP) Strategic Plan 2016-2019 http://www.comp-ocpm.ca/download.php?id=1057

(7) IOMP Newsletter, Vol. 1, No. 4, October 2019 https://www.iomp.org/iomp-newsletter-vol-1-no-4-october-2019/

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A career built on modelling

In my view, the beauty of medical physics resides in its strong interdisciplinary nature. I was always fascinated by radiobiology and during my doctoral studies I had the chance to gain better understanding about the underlying (radio)biological processes that occur during radiation-tissue interactions. Computer modelling came as a natural way to simulate these processes, starting from tumour growth and development, and continuing with the tumour's response to physical and chemical triggers.

Computer models, whether stochastic or deterministic, allow predictive assessment of the multi-parameter processes that govern radiotherapy outcome, allow quantitative treatment optimisations, and more importantly, answer to "what if" questions. The choice of a stochastic (Monte Carlo) approach is justified by the probabilistic nature of all main phenomena occurring during tumour growth and in response to treatment: the initiation of a malignant transformation, the cellular phenotype, the hit-and-kill effect induced by radiation or even by chemotherapeutic agents.

To be able to concentrate on tumour-specific features and behaviour, our modelling work has focused on head and neck cancers treated with combined modality treatment (radiotherapy + cisplatin-based chemotherapy) with the following aims: (i) to grow in silico a head and neck tumour with biologically realistic parameters and growth kinetics; (ii) to incorporate radiobiological properties in the model, many of which are responsible for tumour recurrence; (iii) to simulate the effect of radiotherapy / chemotherapy on the tumour; (iv) to assess the tumour's response to various treatment schedules as a function of kinetic and radiobiological parameters. The choice of head and neck cancer is justified by the several clinical challenges imposed by these neoplasms due to tumour heterogeneities, hypoxia content, high proliferative ability and resilient tumour sub-volumes.

Over nearly two decades of radiobiological simulations, the virtual head and neck cancer model was optimised alongside new radiobiological developments and novel treatment schedules were simulated in search for the optimal therapy as a function of tumour characteristics (hypoxia, proliferation, cancer stem cell fraction, tumour growth kinetics and dynamics). The model showed, among others, that (i) hyperfractionated radiotherapy is superior to both conventional and accelerated RT (in accordance with RTOG trial results); (ii) neoadjuvant cisplatin given every 3-days could be more efficient than current schedules; (iii) small doses of daily cisplatin are superior to weekly large doses, from a tumour control perspective; (iv) cancer stem cell cycle time is crucial in tumour response during radiotherapy; (v) the main repopulation mechanism in head and neck tumours is the symmetrical division of cancer stem cells; (vi) cell recruitment is another possible source of tumour repopulation; (vii) hypofractionated radiotherapy is similarly effective as conventional radiotherapy on oxic and/or mildly hypoxic head and neck cancers, while severely hypoxic tumours require hyperfractionation for adequate tumour control (see figure 1 (a) & (b)) [1].

Model validation is a critical component of simulations/modelling of biological processes, for data correctness, reproduction of results and also credibility. Employing validated models into in vitro settings, one could 'peek ahead' in various directions for what it would be like to follow those paths. Theoretical results offered by models could be a guiding beacon showing the path forward in medical research.

The power of radiobiological modelling of tumour growth and response to therapy stays in the potential of such models to identify gaps in research, indicate trends in cellular behaviour and to open new avenues towards personalised treatment in radiotherapy.

Reference:

[1] Marcu LG, Marcu D. The role of hypofractionated radiotherapy in the management of head and neck cancer - a modelling approach. J Theor Biol 482C: article no. 109998 (2019)

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On the commissioning of Model-based Dose Calculation Algorithms in Brachytherapy

Brachytherapy is a therapeutic technique for the treatment of tumoural lesions that involves placing an encapsulated radioactive source near, directly in contact with or inside a tumour, to irradiate such lesion.

This technique is commonly used as an effective treatment modality for cervical, prostate, breast, and skin cancer. It has also proven to be effective in treating tumoural lesions in other locations, like brain, head and neck (for example, lips or tongue), eye, trachea and bronchial tubes, the digestive system and the urinary tract (for example, bladder, rectum, anus, urethra or penis), the female reproductive tract (uterus, vagina and vulva), and other soft tissues [1]. Therefore, brachytherapy has become a fundamental therapeutic tool [2].

Current clinical dosimetry can be based on protocols such as those from the Task Group 43 (TG-43) of the American Association of Physicists in Medicine (AAPM) [3]. At the time it was proposed, this formalism represented a great improvement with respect to the dosimetry algorithms previously used for the planning of brachytherapy treatments. TG-43 is based on a set of precalculated data tables obtained using Monte Carlo techniques, and measurements for the particular case of low energy seeds. Among other considerations, TG-43 assumes that the patient is entirely made of water and it is submerged in an infinite volume of water. Therefore, this protocol does not take into account the specific radiation dispersion conditions of the patient and the radiological differences of tissue materials or applicators with respect to water.

Unlike TG-43, model-based dose calculation algorithms (MBDCA) [4] represent a new paradigm of brachytherapy dose calculation. These algorithms use all available information about the composition and densities of the different materials that make up the internal geometry of the patient's body. This allows the practitioner to obtain, within the numerical approximations inherent to each method, a more accurate estimation of the absorbed dose received by the patient [5].

Today, there are two commercial versions of MBDCA for high dose rate Ir-192 sources implemented in the corresponding treatment planning system (TPS). They are Oncentra-ACE (Advanced Collapsed-Cone Engine), released by Nucletron (Elekta, Veenendaal, Netherlands) as part of its TPS, Oncentra Brachy v4.4 [6] and the AcurosTM Brachytherapy MBDCA engine, implemented by Varian Medical Systems, Inc. (Palo Alto, CA) within their BrachyVisionTM TPS [7].

Since these planning systems are already commercially available, there is a growing concern in the professional societies because the novel MBDCA users may experience difficulties in transferring the treatments of the protocol used so far, TG-43, to the new planning systems based on MBDCA. Therefore, the clinical user must be fully aware beforehand of the possible dosimetric discrepancies that may arise in those anatomical regions most likely to be affected, that is, those areas where the patient's body composition deviates from TG-43 assumptions (low energy radioisotopes, air pockets, bone structures, applicators, etc.). Therefore, the AAPM, the European Society of Radiation and Oncology (ESTRO) and the Australasian Brachytherapy Society (ABG) have formed the working group WG-MBDCA (Working Group on Model Based Dose Calculation Algorithms) with the objective to "Develop a limited number of well-defined test case plans and perform MBDCA dose calculations and comparisons" that can be used by the clinical practitioner for verification and benchmark. This group, that I am honored to chair, includes twenty two well-known professionals in the field of medical physics. Over the last few years, WGDCBA members have developed the necessary infrastructure to support importing and calculating a series of test cases across the TPS platforms [8,9]. These test cases make use of a generic vendor-independent Ir-192 HDR source and gynecological applicator together with a set of DICOM files. The Joint AAPM/IROC Houston Registry hosts the reference datasets for these test cases and therefore they are offered freely to the community.

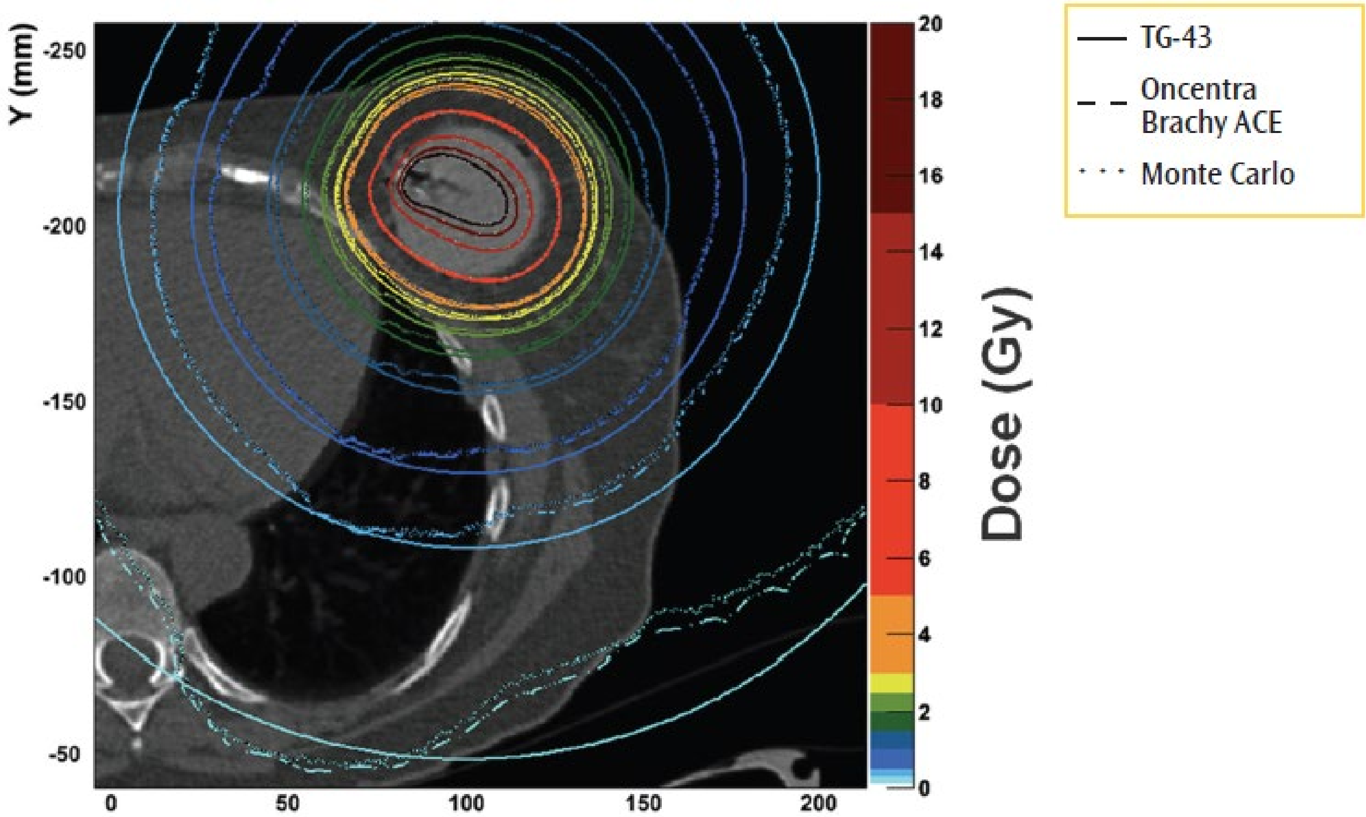

Fig. 1: Dose distribution comparisons of TG-43, MBDCA, and MC. From [6], with permission.

These test cases allow the clinical user to perform the two levels of commissioning required by TG-186 [4] without being forced to perform complex MC calculations on site. They are the following:

1) Test Case 1: Ir-192 source positioned centrally within a 51.1 cm cube of water. It provides a direct comparison of MBDCA TPS absorbed dose calculation results with respect to TG-43 ones.

2) Test Case 2: Ir-192 source positioned centrally within a 20.1 cm cube of water surrounded by air. It shows that the smaller water phantom produces negligible absorbed dose differences within 10 cm of the source as compared to Test Case 1.

3) Test Case 3: Same as Test Case 2, but with the source offset 7 cm laterally to be located at 3 cm away from the water cube surface. It evaluates the dosimetric influence of missing scattering material compared to a large phantom.

4) Test Case 4: Ir-192 source positioned centrally within a generic tungsten-shielded vaginal applicator. It demonstrates the effects of shielding, especially near the source long axis.

As a summary, the test cases proposed by this WG and the procedure for its implementation [10] will allow the clinical user to commission and validate his/her MBDCA of choice. The WG also aims to deliver more clinically-oriented test cases in the following years (breast, head & neck, gynecological and low energy cases). We hope that this effort will contribute to encourage the clinical user to make the long-expected transition from TG-43 algorithms into a more realist depiction of clinical conditions.

References

[1] Gerbaulet A. et al. The GEC ESTRO handbook of brachytherapy (Leuven, Belgium: European Society for Therapeutic Radiology and Oncology) 2002.

[2] Guedea F. Perspectives of brachytherapy: patterns of care, new technologies, and new biology. Cancer Radiother. 2014;18;434-436

[3] Rivard M. J. et al. Update of AAPM Task Group No. 43 Report: A revised AAPM protocol for brachytherapy dose calculations. Med Phys. 2004;31;633-674.

[4] Beaulieu L., et al. Report of the Task Group 186 on model-based dose calculation methods in brachytherapy beyond the TG-43 formalism: current status and recommendations for clinical implementation. Med Phys. 2012;39;6208-6236.

[5] Rivard M. J. et al. The evolution of brachytherapy treatment planning. Med Phys. 2009;36;2136.

[6] van Veelen B, Ma Y, Beaulieu L. Whitepaper: ACE Advanced Collapsed cone Engine, Elekta Corporation, Veenendal, The Netherlands, 2015.

[7] Papagiannis P, Pantelis E, Karaiskos P. Current state of the art brachytherapy treatment planning dosimetry algorithms. The British Journal of Radiology. 2014;87(1041);20140163.

[8] Ballester F, et al. A generic high-dose rate 192Ir brachytherapy source for evaluation of model-based dose calculations beyond the TG-43 formalism. Medical Physics. 2015;42(6):3048-62.

[9] Ma Y, et al. A generic TG-186 shielded applicator for commissioning model-based dose calculation algorithms for high-dose-rate 192Ir brachytherapy. Medical Physics. 2017;44(11):5961-76.

[10] Beaulieu L., et al. Commissioning of Model-based Dose Calculation Algorithms in Brachytherapy: A Joint AAPM, ESTRO and ABG Report. To be published

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Real-Time Adaptive Particle Therapy Of canceR – The RAPTOR consortium

The high precision of particle therapy (PT) comes as a double-edged sword; highly conformal dose distributions have to be delivered in a robust manner to address the high-sensitivity of PT to uncertainties. While the number of clinical PT centres has significantly increased over the last decades, the influence of uncertainties has to be further minimised to exploit the full benefit of PT.

Clinical PT workflows have initially been adopted from conventional photon therapy, where a treatment plan is based on a computed tomography scan and then applied throughout the fractionated treatment course. With the capabilities of new combined imaging and delivery machines (MR-LINAC), the photon therapy world moves towards daily adaptive treatment regimens while PT rarely applies more than 2 to 3 adaptations throughout the fractionated treatment course. Adaptive radiotherapy enables a patient-specific tailoring of treatments, allowing for better target control and less toxicity, especially for highly precise treatment techniques like PT. Imaging capabilities at PT facilities have significantly improved over the last years. CT imaging has been the standard for many years. New PT facilities are often equipped with in-room or near-room CT scanners enabling smooth repeated CT workflows. In the context of adaptive treatments, daily (or continuous during beam delivery) imaging is required. The feasibility of CBCT imaging at modern PT facilities is a first step in this direction. However, to use CBCT images in adaptive workflows, reliable and fast conversions into synthetic CT suitable for PT dose calculations have to be developed. Furthermore, to date, time-consuming manual step-wise treatment workflows, the inflexibility of commercial PT equipment and the high diversity in the PT landscape prohibits a move towards daily (real-time) or even on-line (during beam delivery) adaptive treatment approaches.

Fig. 1: 3rd RAPTOR workshop July 2019, Munich (from the left: Marco Donetti (CNAO), Rok Gajsek (Cosylab), Moritz Wolf (GSI), Stefan ten Eikelder (Tilburg University), Katia Parodi (LMU), Andrej Studen (University of Ljubljana), Antje Knopf (UMCG), Christian Richter (OncoRay), Martin Janson (RaySearch), Heinz Deutschman (MedPhoton), Stine Korreman (Aarhus University Hospital), Francesca Albertini (PSI), Hilda Veenstra-Korf (UMCG))

The **Real-time Adaptive Particle Therapy Of canceR (RAPTOR) consortium** intends to overcome current obstacles to a wide clinical implementation of real-time adaptive PT. RAPTOR is a network of world-class research institutes and industry providing an intercultural and intersectoral platform to work on required developments towards a seamless automatic real-time adaptive PT treatment loop. Initiated by Massachusetts General Hospital, the University of Wisconsin and Cosylab, the consortium now comprises **major European particle therapy facilities** (Academisch Ziekenhuis Groningen (UMCG), Aarhus University Hospital, OncoRay, Paul Scherrer Institut (PSI), MedAustron, National Institute of Radiological Sciences (NIRS), Centro Nazionale di Adroterapia Oncologica (CNAO)), **academic institutions with expertise in medical physics, medical imaging, bioengineering and computational science in the health sector** (Helmholtzzentrum für Schwerionenforschung GmbH (GSI), Ludwig-Maximilians-Universität München (LMU), Tilburg University, University of Ljubljana, Politecnico di Milano, University Oldenburg) and valuable industrial partners (RaySearch, Cosylab, MedPhoton, ProtonVDA).

Together, the RAPTOR consortium strives for the establishment of an innovative training network (ITN) as part of the European Marie Skłodowska-Curie Actions to train the next generation of medical physicist with a holistic view on the future of PT. Foreseen research projects will be carried out at academic healthcare facilities to sharpen the eyes of young medical physics researchers on the clinical needs in the field of PT. The active involvement and collaboration with industry within RAPTOR ensures that the transfer of industry-relevant skills is an integral part of individual research projects. This will guarantee a fast turnover of clinical needs into innovative, marketable, technological solutions. **RAPTOR aims to train a new generation of young medical physics researchers enabling the paradigm shift from manual stepwise to automatic seamless treatment approaches keeping a holistic perspective, assuring standardized clinical implementation of real-time adaptive PT.** The ITN aims to achieve the integration of imaging for treatment planning, treatment planning, QA and treatment verification into a real-time adaptive PT treatment loop. Automation and seamless interfacing will play a key role reaching this objective. **By connecting developments and expertise within all components of a real-time adaptive PT treatment loop, the RAPTOR consortium is uniquely positioned to make the next step in advancing PT.**

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At UMCG Antje Knopf's team works together with collaborators on the treatment of moving targets (thoracic indications) with pencil beam scanned proton therapy, automated patient-specific quality assurance for proton therapy and MR-guided proton therapy. Together with a UMCG grant support team, Antje Knopf coordinates the Innovative training network (ITN) grant application for the European Marie Skłodowska-Curie Action.

Extending MRI Beyond the Current Limits: Of Needles, Gases, and Mummies

Magnetic resonance imaging (MRI) is considered to be the ideal cross-sectional imaging modality for soft tissue visualization – it has an unrivalled adjustable soft tissue contrast, it can acquire images in arbitrary orientations, and it offers functional imaging methods for lesion characterization. Over the recent decades a plethora of new MRI methods have been developed ranging from ever faster acquisition methods with now up to 20 images/s to new image contrasts that are sensitive to metabolites at much lower concentrations than tissue water. Despite these efforts, MRI is still limited for example in spatial and temporal resolution, and in detection sensitivity for molecular imaging. In my research group "Experimental Radiology" at the University Medical Center Freiburg we try to overcome these limitations and to develop new methods and applications. In particular, we are currently focusing on three different research areas in MRI method development: interventional MRI, high-field MRI and advanced imaging concepts.

Today, MRI is rarely used to guide an intervention, even though the target lesion is often much better visible on an MR image than on X-ray or US which are the preferred modalities for image guidance during interventions. The use of MRI during an intervention is hampered by the bulky magnet structures which severely limit access to the patient, and the lack of MR-compatible devices. In our work we have been developing dedicated MR imaging and device tracking strategies, which include active radio-frequency tracking coils in catheters (Fig. 1), functional real-time MRI methods for blood flow and perfusion measurements, in-room user interfaces to control the MRI system, robotic assistance systems for percutaneous instrument placement, and dedicated real-time imaging sequences for device tracking. In collaboration with clinical partners we tailor these methods and devices to the clinical needs - with the Radboud University in Nijmegen/NL we have established an MRI method that uses prior knowledge to track a biopsy needle in real-time for targeted prostate biopsies.

In our high field imaging research, we are currently focusing on new MRI methods to assess tissue oxygenation. In radiotherapy, tissue hypoxia is often associated with radioresistance, so that higher radiation doses are required in less oxygenated regions of a tumour. To measure tissue oxygenation, we directly detect the MR signal of the only MR-sensitive oxygen isotope, ^{17}O. For this, we build dedicated ^{17}O MRI coils, we implement ultra-short TE pulse sequences to overcome the short T2* of ^{17}O, and we realize a gas delivery system to be able to administer isotope-enriched ^{17}O gas in a tracer experiment. Initially, we performed these experiments on a 7T whole body MRI system (DKFZ, Heidelberg), but we could recently show that it is possible to use ^{17}O MRI also at clinical field strengths of 3T to measure the cerebral metabolic rate of oxygen consumption.

Finally, we are developing advanced concepts to push the boundaries of current MR methods. By improving existing sequences for ultra-short T2 MRI we were able to detect MR signals in mummified tissue, and we could image a 3000y-old Egyptian mummy head (courtesy: Prof. F. Rühli, Univ. Zürich/CH) with excellent contrast (Fig. 3). To measure the signals from tissues with an even faster T2 decay such as myelin, we are currently realizing Concurrent Excitation and Acquisition (CEA) MRI which samples the MRI signal already during the radio-frequency excitation. CEA is technically extremely demanding, as the strong background signal from the exciting RF pulse must be suppressed which is 80-90 dB higher than the received MR signal. In another project we realized an ultrafast acquisition with sub-millisecond temporal resolution that is about 10 times faster than current MRI methods. With this technique we were able to measure the vibration of the vocal folds during singing.

All of these research topics are embedded in clinical applications – for the interventions, we teamed up with our local clinical colleagues in Cardiology and Radiology to realize a fully MR-guided stent placement in the coronary artery; the ^{17}O MRI methods are currently adapted to measure tissue oxygenation in kidney transplants at the Univ. Groningen/NL; furthermore, dynamic vocal fold measurements have been developed together with partners from the Dept. for Musician's Medicine to image the vocal tract kinetics in professional singers. Finally, we are engaged in clinical studies that use machine learning for tumour segmentation in radiotherapy.

Some of our research applications such as "mummy MRI" might seem exotic at first glance, but they can lead to new methods with a high clinical impact. To carry out this type of research, it requires both a solid knowledge in various fields of clinical imaging and out-of-the-box thinking. Thus, I feel privileged to be surrounded by students, PhD candidates, PostDocs and collaborators that have exactly these qualities!

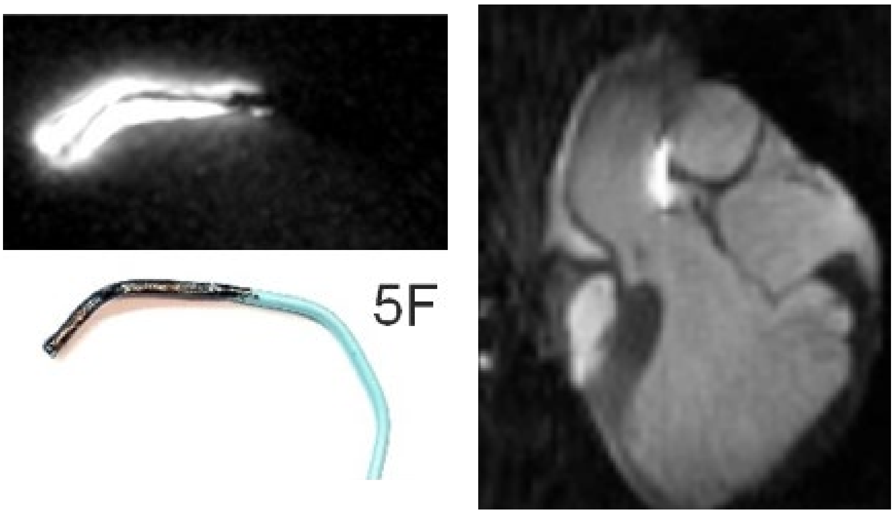


Fig. 1: Left: MRI and photograph of a 5 French active tracking catheter with tip coil (black paint). Right: Real-time MRI of the insertion of the tracking catheter into the left coronary artery.

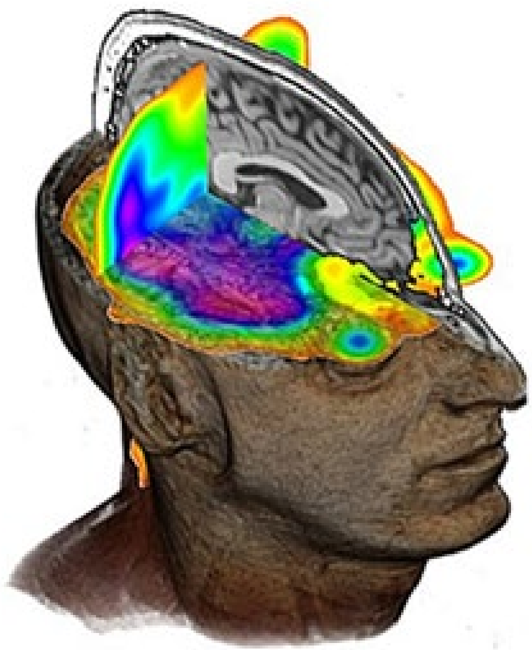


Fig. 2: 3D MRI of the brain from clinical 1H MRI data with overlayed ^{17}O MRI in colour. Oxygen MRI data have a lower spatial resolution due to the low concentration of the stable isotope ^{17}O.

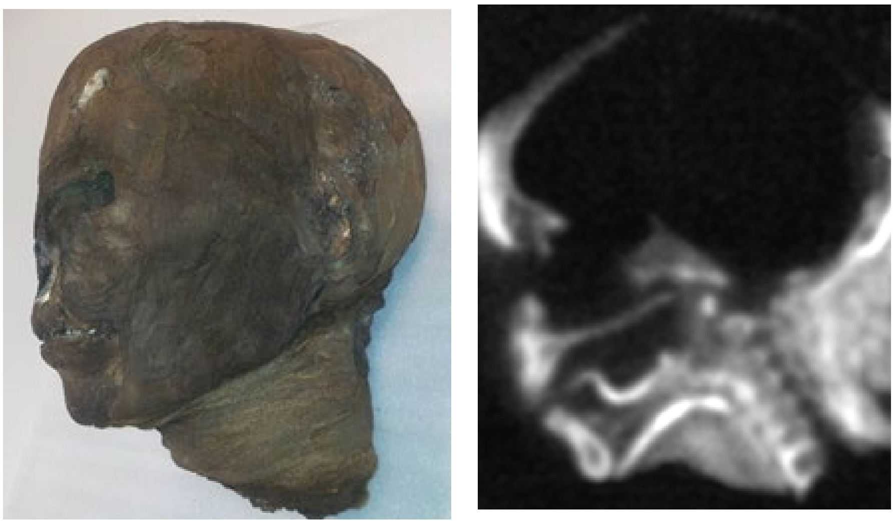


Fig. 3: Figure 3: Photograph (left) and MRI (right) of an Egyptian mummy head. Even though the embalmed head has only a very low water content, it can still be visualized with ultra-short TE MRI techniques.

Michael Bock

Michael Bock studied physics in Braunschweig and Heidelberg, and since 1992 his research focused on various aspects of method development for MRI. For 19 years he worked at the German Cancer Research Center (DKFZ) in Heidelberg where he established research groups on Interventional MRI and Whole Body 7T MRI, and in 2011 he is Professor for Experimental Radiology at the University Medical Center in Freiburg/Germany.

Elekta radiotherapy QA solution verifies in real time for every fraction

EFOMP Company member news

Modern radiation therapy techniques integrate real-time imaging technology and advanced treatment planning, allowing unprecedented tumour control.

This sophistication, however, increases complexity that must be addressed.

"Quality assurance [QA] for radiotherapy includes checks for the linac, patient-specific plans and the treatment process and workflow," says Jurgen Oellig, Managing Director at iRT, a company in which Elekta has partial ownership. "Treatment complexity, though, increases the burden and cost of QA, challenging the efficiency and effectiveness of conventional QA tools.

"Moreover, QA and treatment can't be performed simultaneously," he adds. "To be more efficient, QA needs to be an integral part of treatment planning and delivery."

Several new QA systems are designed to address the demand for treatment verification, including QA during treatment. Current dosimetry systems allow users to collect data for verifying treatment delivery accuracy, but only after the treatment fraction.

The Integral Quality Monitor (IQM) System, developed by iRT and part of Elekta Assurance, is the only solution that collects and verifies radiotherapy delivery accuracy during treatment. For every treatment, clinicians can verify – in real time – every beam and beam segment, at every control point.

IQM independently verifies treatment delivery accuracy compared to the treatment plan, displaying the absolute and relative deviation between the prescribed treatment beam and the delivered treatment beam at all control points.

"The IQM detector technology combines the signal reproducibility of a large ionization chamber with the continuous spatial response of film," Oellig explains. The system verifies all modern treatment techniques, including high-dose rate beams, multi-arc VMAT techniques, small SRS/SBRT beams and large field IMRT techniques. IQM also verifies gated treatment deliveries and total body irradiation with the same level of accuracy and reproducibility."

User-defined acceptance thresholds ensure that every clinically relevant deviation between the treatment plan and the treatment delivery is detected. Exceeding acceptance criteria triggers an automatic alert.

"The IQM workflow is also effortless," he says. "No user interaction is required while IQM monitors treatment delivery. The operator simply exports the plan dataset from the treatment planning system and data acquisition and analysis, in addition to segment-by-segment presentation of results, happens automatically.

"By ensuring verification accuracy and error detection, IQM can improve every QA process," he adds, "while complete integration into the treatment planning and delivery workflows can reduce the clinical workload and can improve clinical efficiency."

Juergen Oellig

Managing Director iRT Systems

Juergen is one of the founders and Managing Director of iRT Systems. With more than 25 years of experience in Radiation Therapy he is actively involved in designing the advanced features of the IQM System. Juergen has a Diploma in Business Administration (Diplom-Kaufmann) from the University of Trier.

End-to-end spatial accuracy of single-isocenter linac-based SRS for multiple brain metastases: Statistical analysis of 3D dosimetry data derived using RTsafe´s PseudoPatient™ technology

EFOMP Company member news

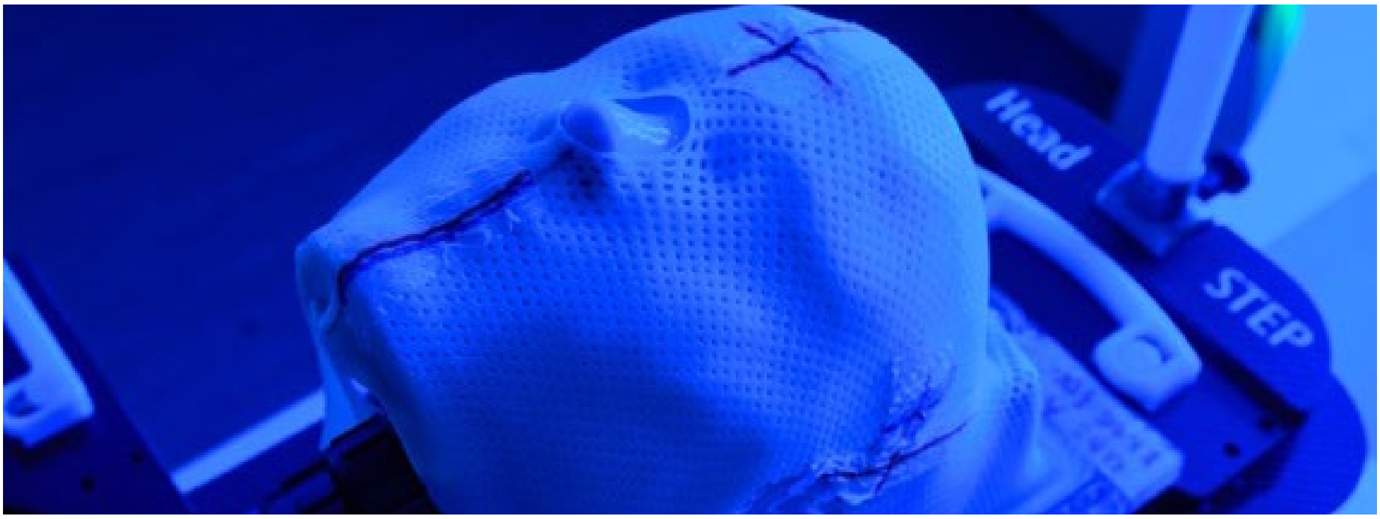
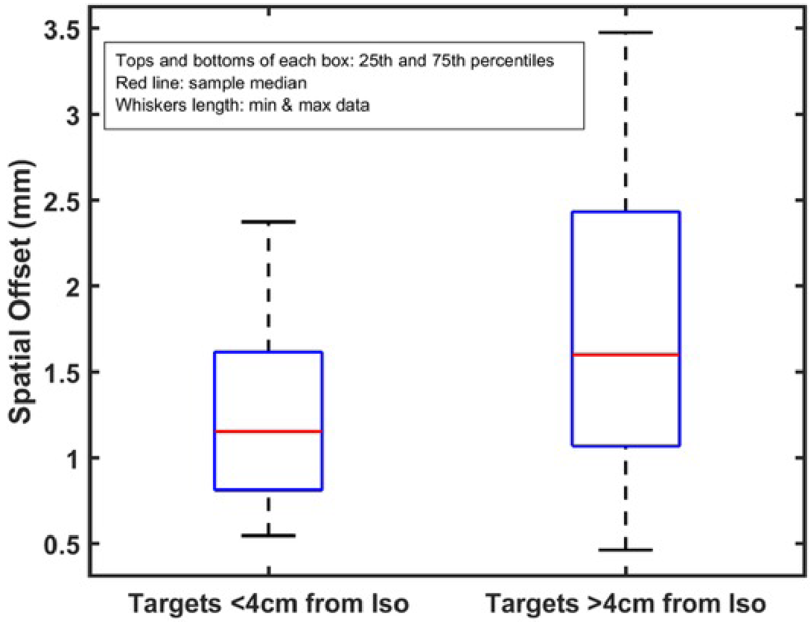


Fig. 1: Set-up of the PseudoPatient™ phantom.

Contemporary Stereotactic Radiosurgery (SRS) treatment approaches for the management of multiple brain metastases often utilize a single isocenter, empowering the minimisation of both treatment time and positioning uncertainties. However, the increased complexity of the SRS treatment chain introduces challenges in overall spatial accuracy. RTsafe having established collaborations with renowned hospitals, academic institutions and enterprises, has access to multiple data from SRS treatments, using all existing techniques or modalities; thus, enabling the extraction of useful statistics derived by experimental end-to-end QA results. After statistically analyzing 3D dosimetry data from 33 patients, the quantification of the overall spatial uncertainties was performed from 208 targets associated with brain metastases and irradiated by 29 commercially available delivery units, including the majority of linac vendors.



Results of the spatial offsets measured by comparing the center-of-masses of gel and planned high-dose area for each target: targets lying at distances less than 4 cm and targets lying at distances greater than 4 cm, from the planning isocenter.

RTsafe's PseudoPatient™ head phantoms, designed for patient-specific quality assurance, were modelled based on each patient's CT dataset, 3D-printed with bone equivalent material and filled with dosimetric gel. The phantoms were treated as if they were the real patients, implementing a realistic clinical protocol. All steps of the treatment chain were simulated in an authentic environment using patient's set-up equipment, treatment plan, and beam sequence.

The 208 studied targets with diameters ranging from 2.3 to 18 mm (median diameter of 6.5 mm) were located at distances from the isocenter up to 74 mm, with a median distance of 37 mm. The gels' 3D dose distribution was extracted by MRI scanning each PseudoPatientTM phantom using specially designed pulse sequences. The overall spatial offset was assessed by measuring the distance between the center-of-masses of the 3D dose distributions of each target, for experimental 3D dosimetry data and Treatment Planning System calculations, respectively. The correlation between spatial offset and distance from isocenter was investigated through the statistical analysis of the results.

Spearman tests revealed a statistically significant correlation between the overall spatial offset and distance from the isocenter with a p-value of 0.018. The 50% of targets lying at distances greater than 4 cm from isocenter, exhibited a shifted dose deposition, relative to that expected from the TPS, ranging from 1.1 mm to 2.4 mm, while for the 30% of them the spatial error was > 2.4 mm. A median offset of 1.6 mm was detected (Figure2). This offset was slightly increased for smaller targets with diameter < 5 mm.

The overall spatial accuracy was found to deteriorate with increasing distance from the isocenter. The presented results suggest that a millimeter-level margin should be considered at least for the most distant and small size targets.

Kyveli Zourari

Medical Physicist - Product Manager

Kyveli is focused on developing a comprehensive dosimetry audit program dedicated for SRS & SBRT applications. Prior to RTsafe, she gained experience in computational & experimental dosimetry, as well as, dosimetry audits in radiotherapy as a scientific associate at the Medical Physics Laboratory of Medical School, National and Kapodistrian University of Athens and medical physics at the Greek Atomic Energy Commission. She has a PhD in Medical Physics from the Medical School of the University of Athens.

Emmanouil Zoros

Medical Physicist – Product Manager

Emmanouil is responsible for product management, data analysis, and film dosimetry at RTsafe. He has a Diploma in Applied Mathematics & Physics from the National Technical University of Athens and a Master of Science in Medical Physics from the National and Kapodistrian University of Athens. His research interests focus on radiation therapy with emphasis on quality assurance in stereotactic radiosurgery, experimental and computational dosimetry using Monte Carlo simulation techniques.

The Brazilian Congress of Medical Physics and the 50th anniversary of ABFM

The XXIV Brazilian Congress of Medical Physics and other satellite events took place between August 18th - 24th, 2019. This intense week began with the launch of the Marília Teixeira da Cruz Courses, which took place at Quintal da Bela, which was the residence of Professor Marília. The name was specially chosen to honour this teacher who has influenced several generations of Medical Physicists in Brazil. The 1st Marilia Teixeira da Cruz Course took place on August 19th and 20th at the Radiology Institute of the Clinical Hospital of the USP School of Medicine, with courses in the areas of Radiotherapy Physics, Computed Tomography and Breast Imaging. In addition to several national teachers, the courses had special participation from speakers Cynthia McCollough, PhD and Luis Fong de los Santos, PhD, from the Mayo Clinic in the United States, and Ioannis Sechopoulos, PhD, from Radboud University, in the Netherlands. More than 120 Medical Physics professionals, residents and graduate students attended the courses.

Fig. 1: Group photo of the participants

August 21st was dedicated to the holding of an important Workshop on Teaching in Medical Physics, held on the USP Polytechnic School in Santos, which brought together teachers, undergraduate, graduate and residency coordinators and students to discuss strategies for improving the training of professionals in Brazil. The space was dedicated to the presentation of experiences in the different areas of training of Medical Physicists and the debate of ideas.

The opening ceremony of CBFM2019 took place on the evening of August 21st, bringing experiences outside the traditional areas of physics or medical physics, with more general approaches to women's leadership experiences in medical physics and the challenges of balancing family life with competitiveness in the academic environment. For this, the event had the testimony of the Professor Cynthia McCollough, president of the American Association of Physicists in Medicine Physicians (AAPM), and Professor Fernanda Staniscuaski, from the "Parents in Science" group. The opening program also included a performance from the "Guri Project" guitar ensemble.

Fig. 2: Impressions of the main program

The main program of the Congress took place from August 22nd to 24th, with the participation of more than 600 attendees, 15 international and 15 national speakers. At the entrance of Mendes Convention Center, the attendees found a huge "timeline" with photos that helped tell the history of Brazilian Medical Physics since the foundation of ABFM. In this large poster, the congress participants could write their own stories and record the historical moment of ABFM's 50th anniversary celebration.

Mornings were dedicated to short courses in the areas of Radiotherapy, Radiology and Nuclear Medicine; 23 lectures, 8 round-table discussion sessions and 6 events sponsored by exhibitors were held. The scientific presentations had 42 oral presentations and 146 posters distributed in the various areas of knowledge of Medical Physics. In addition, a trade fair with 13 companies that provide equipment and services to the healthcare community.

Fig. 3: “Timeline” with photos telling the history of Brazilian Medical Physics since the foundation of ABFM

The final two days were crowned with special sessions commemorating the 50th anniversary of the Brazilian Association of Medical Physics. In these sessions, tribute was paid to the founders of ABFM and movies were presented that told the trajectory of this Association since its foundation in 1969, to the present day. They were moments of great emotion and, at the same time, fun, with stories told by important pioneering characters from the Association.

Fig. 4: The Founders of the ABFM

Several other activities rocked the CBFM2019, such as a beach volleyball tournament in the mornings of the event, the “Laura Furnari” Prize for photography, a board-game room, and various activities organized by exhibitors at the trade fair. For dads and moms, a babycare service was offered. Finally, a big party ended Friday with great joy to celebrate ABFM‘s 50th anniversary. All this in a very festive, happy and relaxed atmosphere.

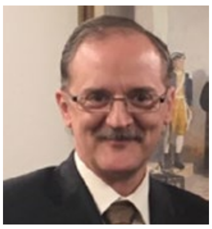
The event program is still available at www.cbfm.net.br and photos illustrating the atmosphere of the event can be found at facebook.com/cbfm2019.

Paulo Roberto Costa

He is PhD in Physics from the University of São Paulo where is Associated Professor at Institute of Physics. He was president and vice-president of the Brazilian Association of Medical Physics (ABFM) and member of the Board of Directors of this association. He is Certified Specialist in Diagnostic Imaging by the ABFM. He was President of the 2019 Brazilian Congress of Medical Physics.

Alessandra Tomal

She is PhD in Physics from the University of São Paulo. She is Assistant Professor at Institute of Physics Gleb Wataghin at University of Campinas. Her research work is focused in mammography imaging, x-ray spectroscopy and Monte Carlo simulation. She was Program Coordinator of the 2019 Brazilian Congress of Medical Physics.



Homero Lavieri Martins

He is MSc in Physics from the University of São Paulo. . He was president and radiotherapy director of the Brazilian Association of Medical Physics (ABFM) and he is Certified Spacialist in Radiotherapy by this Association. He is currently the President of the Brazilian Association of Medical Physics.

Some Impressions can be found via the following links:
General view | Interviews | Round tables1 | Round tables 2 | Special talks

8th MR in RT Symposium 2020

Fig. 1: From left to right: Hall 02, Old Bridge in Heidelberg and the DKFZ Building

We would like to cordially invite you on behalf of the organizing and scientific committees to the **8th MR in RT Symposium.** The meeting will take place in the city of Heidelberg, Germany, **from Monday, May 25th to Wednesday, May 27th, 2020.** Heidelberg is well known for its unique combination of a romantic old town and a bustling science campus. It hosts the biggest German biomedical research institute, the German Cancer Research Center and the oldest German university, established in 1386.

The fast technological development and the rapid clinical implementation of MRI for radiotherapy are currently the most exciting as well as most challenging developments in radiation oncology. With this science symposium we would not only like to bring together specialists from all involved disciplines, but also to foster a discussion about the scientific direction of the field. The latest developments in physics and technology of MR-guided radiotherapy as well as clinical directions and results will be presented.

We are looking forward to your abstracts for posters and oral presentation to the 8th MR in RT Symposium in Heidelberg 2020.

Prior to the symposium **(May 24th, 2020)** we will organize a **Satellite Symposium** about **"Dosimetry and QA in MR Guided Radiotherapy: from primary standards to clinical solutions"** for a limited number of attendees to have a more in-depth look into some aspects of clinical procedures for QA and dosimetry at an MR-Linac. Additionally, we will schedule a visit to the unique proton-ion beam therapy center at Heidelberg University Hospital close to the satellite symposium for a limited number of visitors.

Deadlines

- Registration
  - Early Bird Registration: until March 15th 2020
  - Regular Online Registration: until May 18th 2020
  - On-site Registration: May 24th and 25th 2020
- Abstract deadlines
  - Abstract Submission: December 16th 2019
  - Confirmation of abstracts: March 02nd 2020
- First draft of program online: March 02nd 2020
- Final program online: April 15th 2020

Further information about the symposium is available at: www.dkfz.de/mrinrthd2020.

Please feel free to contact us at mrinrthd@dkfz.de.

We are looking forward to seeing you in Heidelberg in 2020!

Fig. 2: Anna Moshanina, Marcel Schäfer, Dr. Simone Barthold-Beß, the organizers of this event. © dkfz.de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1st EFOMP Photography Contest

EFOMP Photography Contest Winner Announcement

Winning photograph of the first EFOMP

Photo Contest:

Malin Head, Co. Donegal, Ireland

by:

Brenda Byrne BA, MSc

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Jaroslav Ptáček, Czech Republic: Black and white photography and me - an analogue story

My first memories about photography are from early childhood. I used to help my father developing black and white films and photo papers in our provisional darkroom, created from the storeroom. By that time, being only a small child, it was like magic. Developing films was less exciting of course. You just put the exposed roll in the development tank, use chemistry and time, and obtain the result. But images … it felt completely different. Putting white paper into the developer and watching how the photograph emerges was very fascinating.

My father used a Zenit-E camera. At that time in the Czechoslovak Socialist Republic and having limited financial resources this was one of only a few thinkable options. During our family trips I always wanted to take photos by myself, but was seldom allowed to. The camera was heavy for me then and completely manually operated!

After 1989 there were more options regarding how to take photos and colour films become largely available here. By that time my father had bought a Practica BC-1 and after that some film compact cameras and started taking colour pictures rather than black and white photos. The development was not done at home and it was not an adventure for me any more; that was when I lost photography from my sight for some years.

Fig. 1: The first frame from the 20 year-old already exposed film – my daughters picking blueberries (in Jeseniky, Czech Republic).

During my university studies, digital photography became available to the general public. So I bought a Minolta Dimage S404 and started taking photos again – this time digital ones. Before my first daughter was born I switched to a Canon EOS 350D DSLR camera. I spent a few years playing around with digital photos, overwhelmed by the endless possibilities at the beginning and bothered by them in the end. I found myself not thinking about the photo, but just taking large numbers of pictures and probably not going through all of them any more.

Five years ago I found my father`s old Zenit-E and one roll of old black and white film. I was just leaving for a vacation with my daughters and decided to take the opportunity to document it using this camera. Photography became an adventure again! I bought a development tank and chemicals and developed the roll just after we returned. It turned out that it was the same roll of a film that I had exposed more than 20 years previously, during a school trip. The quality of the result was disastrous. But I knew that I had made the pictures by my own hands and I liked them anyway!

I started to take black and white photos then. First with the Zenit, then Practica and I ended up with a Pentax Spotmatic F (older than I`m actually). I`ve learned some basics of the process of film development and factors influencing the result. But I don`t care too much. We don`t live in labora-

Fig. 2: An unexpected visitor to EFOMP officers meeting in Woudschoten (The Netherlands).

Sometimes I like the results, sometimes I don`t. But I have to think again about each and every photo I decide to take, and I always hope that this one will be my best.

tory conditions and I don`t necessarily need to spend hours trying to get the exact temperature, exact concentration, exact timing, etc. My photos are not for sale and I`m not a professional. I just want to relax and have fun! From time to time I try different film brands, different developers, or I change the timing or agitation and observe the results.

I take my camera with me to nearly all trips I`m going to, and try to catch what I see through the lens. Also my daughters are frequent subjects of the photos (which doesn`t make them happy as they are on the verge of puberty now).

Fig. 3: The TV tower on top of the highest point in Jeseniky (Czech Republic) - Praděd (elevation 1492 m).

Jaroslav Ptáček
University Hospital Olomouc

Jaroslav studied medical physics at the Czech Technical University in Prague, gaining masters degree in 2003 and Ph.D. degree in 2014. He works at the Department of Medical Physics and Radiation Protection at University Hospital Olomouc from 2003, he is a clinical medical physicist in nuclear medicine from 2006 and he became the head of the department in 2009. He was the member of the board of the Czech Association of Medical Physicists between 2006-2010 and its president from 2010-2018. From 2013 he became involved in EFOMP, first as one of the organizers of ESMPE editions in Prague, then in 2017 as an Assistant Secretary General, and for the period of 2018-2020 as a Secretary General.

Borislava Petrovic, Serbia: Hobbies and sporting activities of Serbian medical physicists

The Serbian Association of medical physicists is a small group that grows slowly, year by year. At this moment, when we write, there are 61 members, all working in clinics throughout Serbia in radiotherapy, nuclear medicine and diagnostic departments.

The annual meetings and its social events really encourage connections between people, and we have found out that many colleagues have hobbies and interests beyond their original clinical work, and that there is great diversity, although many are converging towards sports and music.

To collect data for this article, we have conducted a short survey among members, where of these 61, there were 23 responses to the anonymous questionnaire. The questions were as follows:

1. What was your motivation to study physics?
2. When was the first moment you heard that medical physicists are working in hospitals?
3. What was your road bringing you to medical physics in your current workplace?
4. Do you have a hobby?
5. Do you play an instrument?
6. Do you practice any sports?
7. What was the success in your hobby/sport/instrument of which you are most proud?

Now, as for the first question responses, as expected, most of people (more than a half) responded with "I love nature and it's laws", the rest responded with gratitude to their school teacher, and one colleague found a motivation in the works and achievements of Nikola Tesla and the Curie family.

The answers to the second question was surprising: a quarter of all answers claimed that it was the elementary or secondary school when they heard that there is a profession of medical physicist, and 75% of answers were during BSc studies in physics (either at the beginning or later). Only 3 people responded that they have heard of such a profession when they were already looking for a job.

Another interesting set of answers was for the third question. Exactly half of people have read the open call for the position of medical physicist, while other the other 50% came to work in medical physics following a recommendation (already worked on BSc or MSc work in clinic, or volunteered, or from a senior colleague at the hospital).

Fig. 1: Horse riding national winner

Fig. 2: Fishing bass- national representation team member

The hobbies are widely different: but it is interesting that the majority of people do have at least one hobby – only 20% responded with wording “none”. The hobbies range from reading science books, learning different languages (one in four people), singing in chorus or groups (25% of respondants), climbing mountains and hiking (20%), fishing (20%) etc. We even have a very active speleologist and also a brooch maker!

Regarding the question with instruments, we could easily have a very good orchestra. One half of people is, or was, playing an instrument: 20% were playing the accordion, one in 5 is playing a guitar, we have a drummer, and also piano and tamburizza players.

But the sports question was a great surprise: only three responses were “no”. One third of people were doing sports for many years, or are still doing a sport with a ball (volleyball, handball, football or tennis). Almost a quarter of people were practicing karate or aikido. The remaining group is very heterogeneous, doing dancing, ultramarathon, diving, fitness, running, swimming, boxing, horse riding, etc.

The last and most astonishing answers were from the highest achievements and greatest successes: almost half of people have achieved high-level wins in competitions or great successes in their hobbies or sports! We have medical physicists who were national winners or members of national representation (fishing, horse riding, football, accordion orchestra and as single players), medical physicists who performed as singers in church chorus in the famous chorus festival Mokranjcevi dani and won 1st place, singers in ethno group performing in concert, significant results of volleyball team, judges in international table strategic games, and finally a medical physicist who is a member of an international team in speleology, contributed to writing a book of national importance, with topic in natural beauties of Serbian Karst mountains.

All together, now we know more about the colleagues with whom we collaborate. We do appreciate our diversities, although the root of it is also in physics – we can probably do any job in the world as physics gives a broad education, understanding of different processes and many opportunities that we are not even aware of!

Fig. 3: The music of physics

Fig. 4: The physics of music

Borislava Petrovic

President of Serbian Association of medical physicist

President and co-founder of the Serbian Association of Medical Physicists. Dr. Petrovic holds a PhD in the field of medical physics, and is working as chief of the medical physics group at the Radiotherapy Clinic, Institute of oncology Vojvodina, Sremska Kamenica. She is also the Associate Professor of Medical Physics at the University of Novi Sad, Faculty of Sciences, Department of Physics

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Book review

Hendee's Physics of Medical Imaging, 5th Edition, Authors: Ehsan Samei, Donald J. Peck; preceded by William R. Hendee, Medical Imaging Physics, published by John Wiley & Sons, Inc., Hoboken, NJ 07030, USA. First published 2019, 468 pages, XXII, 437 figures (most of them in color), ISBN: 9780470552209 (hardcover).

1. Description

The book "Hendee's Physics of Medical Imaging" originates from the decision of making an updated version of the successful text "Medical Imaging Physics", 3rd Edition, by William R. Hendee and Russell Ritenour as authors. Ehsan Samei and Donald Peck took the responsibility of making the revision. During the project the book took its life on its own and its name was changed to "Hendee's Physics of Medical Imaging", alas maintaining the 5th edition tag to keep its connection with the original William R. Hendee's book. Indeed, this book is a celebration of Medical Imaging as an interdisciplinary field, where the fundamentals of the radiation interaction with matter are connected with the biological and medical disciplines within the frame of *Imaging Science.* All the major medical imaging techniques are described in depth as optimized tools for each clinical purpose. A total of 437 figures and numerous tables accompany the 468 pages of the book: all the illustrations are accurately selected to support the text so as to be fully understood by the reader. The book consists of 11 sections (one introduction and 10 chapters). As in the original text, no numerical examples are interspaced within the text and no problems are presented. The chosen approach is that of a teaching book with a descriptive nature that always discusses the principles behind the various imaging techniques and the rationale for their application in medicine.

2. Purpose

The book can be used not only as a complete textbook for graduate students in medical physics, at PhD and Specialty School level, but also as an indispensable reference text for medical doctors, who are working in all fields of imaging (radiology, nuclear medicine, cardiology, radiotherapy). Its content is excellent for medical physics candidates who are preparing for certification in medical physics sub-specialty. In general, this book will be very useful to all professionals who are making use of either non-ionizing or ionizing radiation in their practice.

3. Contents and features

The book starts with an introduction that guides the reader to the "Role of Imaging in Medicine" and contains a brief and clear presentation of the various subfields of radiation imaging. Then ten chapters follow, that are robust on their own, but are also tightly interconnected with each other, so as to give the reader an integral overview of the field. The first Chapter is a review of Radiation and Matter. It is a concise but precise nuclear physics introduction that covers both natural radiation and artificial radiation (e.g. X-ray production) and their interaction with matter. The last part of this chapter is devoted to the description of the basic radiation detectors. In chapter 2 the reader is then conducted hand-by-hand through the disciplines of anatomy, physiology and pathology that are of interest for Imaging in Medicine. Many times these topics are not present in medical imaging books or their treatment is too limited. This is not the case in this book. I am convinced that this chapter is essential for medical physicists who want to work successfully in medical imaging, because it gives them the basic knowledge and the proper language to interact and discuss with the medical doctors. Chapter 3 covers "Imaging Science" presented as a sub-discipline *per se* that is applied and extends to all imaging techniques. The efforts by the authors of the book have been devoted to the basic of Imaging formation and analysis, not forgetting the statistics and image processing. This is a field that is rapidly evolving with the advent of Artificial Intelligences (AI) in Medical Imaging and I am sure that next edition of this book will cover at length this topic as well. The following Chapter 4 treats the field of radioprotection of the patient, i.e., radiobiology, dosimetry and protection. The radiation effects at cellular level and at the animal level are very well summarized and provides the reader with a solid preparation on the safe use of radiation in medicine. Medical physicists must be well trained in this field since they often act as an interface between the patient and the medical doctors, and between the medical imaging discipline and the population at large. Chapter 5 covers the topic of operational imaging, both as human vision and medical displays. The topic of display performance and their quality control is becoming more and more relevant. However, it is often only marginally touched in other imaging books. Here the expertise of one of the authors in this field is very evident by the excellent content of the chapter. The remaining five chapters cover the five pillars of the medical imaging techniques and their clinical applications, i.e., Projection X-ray imaging (chapter 6), Volumetric X-ray Imaging (chapter 7), Nuclear medicine (chapter 8), Ultrasonography (chapter 9) and finally Magnetic Resonance Imaging (chapter 10). It should be noted the modern terminology adopted of Volumetric X-ray imaging that properly groups Tomosynthesis and CT, since the first one was the funding technique for the onset of CT. These chapters cover the physical and technical issues without forgetting the clinical applications and the description of the state-of-the-art apparatuses. Chapter 8 on Nuclear Medicine is somehow limited especially for the part referring to PET, but the principles and the fundamental issues are present. The longest chapter of all (more than 100 pages) is that one on magnetic resonance (chapter 10), where the physics of MR imaging is extremely well covered and can be used as a book within a book for learning what is MR imaging. Only touched in this chapter are the hybrid scanners, e.g. PET/MR and SPECT/MR, the clinical use of which is rapidly expanding worldwide. Each chapter has a robust

https://doi.org/10.1016/j.ejmp.2019.10.037

1120-1797/

bibliography, that allows the reader to elaborate on any argument treated in the book. A well sorted analytical index completes the book.

4. Assessment

This is an accurate and complete textbook and reference book that covers the history, the principles and the state-of-the-art of Medical Imaging. I particularly recommend this book to the physicists and engineers who are involved, or plan to become involved, in this discipline both in research laboratories and in the clinical practice. On the other hand, radiologists, nuclear medicine doctors, cardiologists, neurologists and other clinicians will find this book very useful and handy for any technical/technological problem they need to have clarified.

5. Reviewed by Alberto Del Guerra

Alberto Del Guerra has been Professor of Medical Physics at the University of Napoli (Italy), the University of Ferrara (Italy) and the University of Pisa (Italy), Head and Director of the Medical Physics School of the University of Pisa, Leader of the Functional Imaging and Instrumentation Group of the Department of Physics of the University of Pisa, President of the European Federation of Organizations for Medical Physics (EFOMP), Member of the ADCOM of the IEEE NPSS Society. He is now retired professor at the University of Pisa and Honorary Editor of the Journal Physica Medica, EJMP.

Alberto Del Guerra
Department of Physics "E.Fermi", University of Pisa, 56127 Pisa, Italy

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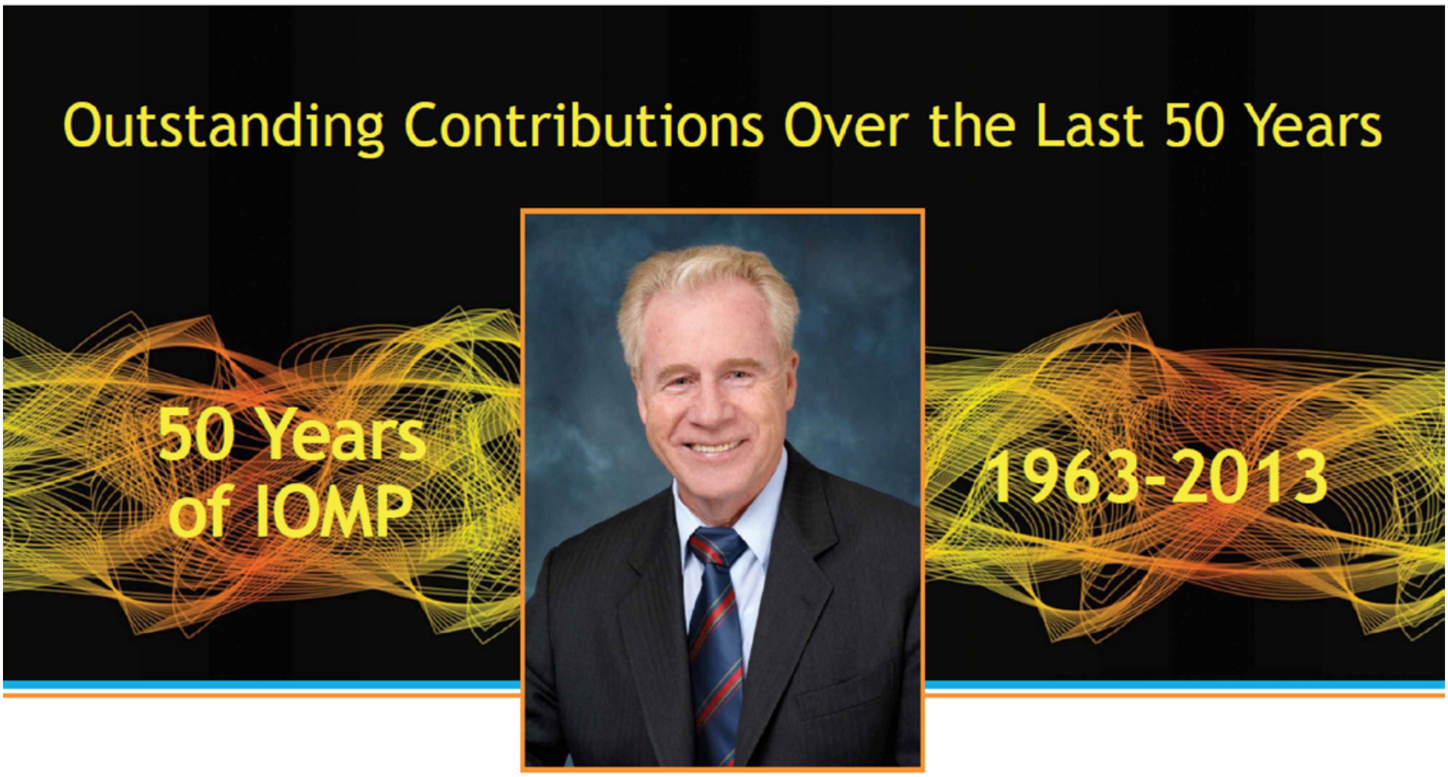
Obituary

Prof. Barry John Allen passed away on 20th Nov. 2019

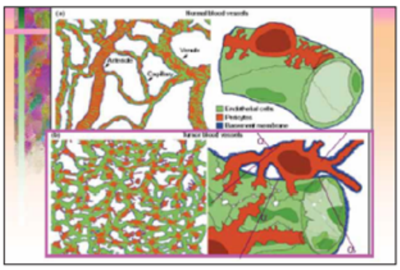


Barry J Allen

Barry Allen PhD DSc is a Professorial Fellow at four Sydney Universities. Previously, he worked at the Australian Nuclear Science and Technology Organisation (ANSTO) as a Chief Research Scientist and more recently as a Principal Medical Physicist Specialist in the Cancer Care Centre and Clinical School at St George Hospital in Sydney.

In the early 1980's Barry Allen began R&D programs in Boron Neutron Capture Therapy (BNCT) for cancer and In Vivo Body Composition (IVBC) for medicine. He designed the in vivo nude mouse irradiation facility at the Moata reactor at Lucas Heights, demonstrating the induction of double strand breaks in DNA arising from neutron capture induced auger emission. Barry went on to become President of the International Society for Neutron Capture Therapy and to convene the Fourth International Symposium in Sydney in 1990.

Barry Allen designed the first human body protein monitor (BPM) in Australia at Lucas Heights, which was installed at Royal North Shore Hospital where it continues to operate today in collaborative clinical studies with most Sydney hospitals. The BPM was an important research tool in studying the efficacy of management of many paediatric and adult diseases and treatments, including cystic fibrosis, renal disease, AIDs, cancer and surgery.



The hierarchy of normal tissue blood vessels is shown in Fig a. The chaotic and leaky tumour capillaries are shown in in fig b, which allow the extravasation of the alpha immune-conjugate to target antigens on pericytes and perivascular cancer cells. Emitted alphas kill the endothelial cells, shutting down the capillaries and starving the tumour.

The Targeted Alpha Therapy (TAT) project, begun in 1994, was successful in developing new agents for the treatment of melanoma and leukaemia, breast, prostate, pancreatic and colorectal cancers. Barry was Study Director of two world first trials of intralesional and systemic targeted alpha therapy for metastatic melanoma, with 51 patients treated in these Phase I trials. Barry developed the tumour anti-vascular alpha therapy (TAVAT) concept to account for regression of solid tumours by alpha therapy, since confirmed by Monte Carlo calculations.

A further development was the biological dosimeter for systemic radiotherapy, based on the formation of micronuclei in lymphocytes. Barry Allen has published over 320 papers in neutron and biomedical physics. Research topics include neutron capture gamma rays, resonance cross sections, stellar nucleosynthesis, clinical in vivo body composition, neutron capture therapy, macro and micro-dosimetry, microbeams, biological dosimetry and preclinical and clinical targeted alpha therapy. He is a co-author of the text book "Biomedical Physics in Radiotherapy for Cancer" (2011).

Professor Allen achieved Fellowship in the AIP (1972), the APS (1981), the ACPSEM (1992) and the Institute of Physics (1999). He was elected President of ACPSEM in 1998, AFOMP in 2003, IOMP in 2006 and IUPESM in 2009, introducing many new initiatives in these organisations, including the Health Technology Task Group for developing countries. He convened the 2003 World congress on Medical Physics and Biomedical Engineering in Sydney.

ICMP 2013 The International Conference on Medical Physics 50 years of IOMP

ESMPE European School for Medical Physics Experts

Innovation in technology in Nuclear Medicine

Jointly organised by ESMPE, ESMIT and COCIR

23rd-25th January 2020, Prague, Czech Republic

The EFOMP, EANM (The European Association of Nuclear Medicine) and COCIR (The European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry) in collaboration with the Czech Association of Medical Physicists and the Department of Dosimetry and Application of Ionizing Radiation of Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague would like to invite you to the next ESMPE on **23nd-25nd January 2020**.

The school will be aimed at advanced tasks connected to molecular imaging related to methods and detector technology . The school will cover the main physics aspects of multimodal PET and SPECT imaging systems, patient dosimetry and optimization.

This edition is jointly organized by EFOMP, ESMIT and COCIR. Lecturers identified by COCIR will give insides on the new trends for novel PET and SPECT equipment.

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in the Nuclear Medicine Imaging field. As in last year's school, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

Content

Methods and detector technology for improved imaging
New technology related to imaging positron and single photon emitters
Image optimization, dose reduction and future perspectives
Progress in SPECT, SPECT-CT and SPECT-MR
Progress in PET, PET-CT and PET-MR
Nuclear Medicine and Machine Learning
Quantification methods

Final exam

The final exam is voluntary. Participants can gain additional credits when they successfully pass the test.

Organisers

Adriaan Lammertsma , Stefaan Vandenberghe (Scientific Chairs)

Alberto Torresin (Chair of the School)

Jaroslav Ptáček, Tereza Hanušová (CAMP)

Faculty

Jun Bao	United Imaging
Ronald Boellaard	Amsterdam UMC - Vrije Universiteit, Amsterdam, The Netherlands
Christian Brueckner	Siemens, COCIR
Brian Hutton	University College London, United Kingdom
Michel Koole	KU Leuven, Belgium
Fotis Kotasidis	General Electric, COCIR
Akos Kovacs	Mediso
Adriaan Lammertsma	Amsterdam UMC - Vrije Universiteit, Amsterdam, The Netherlands
Mark Lubberink	Uppsala University, Sweden
Martha Moryson	Siemens, COCIR
Roth Nathaniel	Spectrum Dynamic
Alberto Torresin	ASST Niguarda, Milano, Italy
Roel Van Holen	Ghent University, Ghent, Belgium
Stefaan Vandenberghe	Ghent University, Ghent, Belgium
Stephan Walrand	Université Catholique de Louvain, Brussels, Belgium

Thursday 23rd January 2020				
	Session	**Title**	**Description**	**Lecturer**
8:00-9:00	Registration			
9:00-9:30	Introduction	Setting the scene	Presentation of the ESMPE and introduction to the course	A Torresin, A Lammertsma, S Vandenberghe
9:30-10:30	Single photon imaging	Novel shapes and production processes for collimation	Methods and detector technology to improve imaging of single photon emitters	R van Holen
10:30-11:30		Dedicated and CZT based SPECT systems		B Hutton
11:30-12.00	Coffee break			
12:00-13:00	Single photon imaging	Molecular imaging outside conventional nuclear medicine	Methods and detector technology to improve imaging of non-standard single photon emitters, used in theranostic applications	S Walrand
13:00-14:30	Lunch break			
14.30-15.00	General Electric	Single photon imaging New technology , image optimization , dose reduction and future perspectives	Acquisition and reconstruction protocols optimized by the vendor. QA tests carried out by vendor. Feedback processes. How to configure the relevant parameters. Future perspectives	F Kotasidis
15.00-15.30	Mediso			A Kovacs
15.30-16.00	Philips			COCIR
16:00-16:30	Coffee break			
16:30-17:30	Siemens	Single photon imaging New technology , image optimization , dose reduction and future perspectives	Acquisition and reconstruction protocols optimized by the vendor. QA tests carried out by vendor. Feedback processes. How to configure the relevant parameters. Future perspectives	C Brueckner
17.30-18.00	Spectrum Dynamics			R Nathaniel
20:00-23:00	Social dinner - participants + lecturers			

Friday 24th January 2020

	Session	Title	Description	Lecturer
09:00-10:00	PET imaging	PET/MR	Progress in PET/MR detector performance, system design and analysis methods	M Lubberink
10:00-10.30	Coffee break			
10:30-11:00	PET imaging	Digital PET	Progress in PET, PET-CT and PET-MR based on SiPMs	R Boellaard
11:00-11:30		PET systems	Progress in PET system design	S Vandenberghe
11:30-12:30		On-line blood sampling and kinetic analysis	Detailed description of methods for advanced quantification of dynamic PET studies	M Koole
12:30-14:00	Lunch break			
14:00-15.00	GE	PET imaging New technology , image optimization , dose reduction and future perspectives	Acquisition and reconstruction protocols optimized by the vendor. QA tests carried out by vendor. Feedback processes. How to configure the relevant parameters. Future perspectives	F Kotasidis
15.00-16.00	Philips			COCIR
16:00-16:30	Coffee break			
16:30-17:30	Siemens	PET imaging New technology , image optimization , dose reduction and future perspectives	Acquisition and reconstruction protocols optimized by the vendor. QA tests carried out by vendor. Feedback processes. How to configure the relevant parameters. Future perspectives	M Moryson
17:30-18:30	United Imaging			J Bao

Saturday 25th January 2020				
	Session	**Title**	**Description**	**Lecturer**
09:00-10:00	The future of SPECT	Standard imaging	Summarize the progress in the field of SPECT for imaging low energy photons	R VanHolen
10:00-11.00		Theranostic imaging	Summarize the progress in the field of SPECT for imaging higher energy photons	S Walrand
11:00-11:30	Coffee break			
11:30-12:15	Total body PET	New possibilities for clinical (research) applications	Advantages of TB PET for clinical (research) studies	A Lammertsma
12:15-13:00		New innovative designs	Progress in the development of medium cost TB PET	S Vandenberghe
13:00-13:45		Progress in and challenges for postprocessing	What do we need to fully utilise total body PET?	R Boellaard
13:45-14:30	Final examination			

Further Information

Course language	English
Level	MPE
Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner)	300 € 350 € (from 1 December 2019)
Reduced registration fee* • subsidized by EFOMP • first-come, first-served policy • deadline for application (20.12.2019)	150 € - for the first 15 attendees (max. 2 from one country) coming from the following European countries: Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Estonia, Greece, Hungary, Kosovo, Latvia, Lithuania, North Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Turkey, Ukraine.
Maximum number of participants	80
Duration	23nd - 25nd January 2020
Study load	17.5 hours of lectures and demonstrations
Venue	Department of Dosimetry and Application of Ionizing Radiation, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Břehová 7, 115 19 Prague 1, CZECH REPUBLIC
GPS coordinates	50°5'27.737"N, 14°24'58.713"E
Accommodation	Individual
Information, programme at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	1st September 2019 – 22nd December 2019

* payment must be done in 14 days following the pre-registration, otherwise pre-registration will be cancelled and neither free place nor subsidized or ordinary fee can be granted for repeated registration

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ESMPE European School for Medical Physics Experts

Statistics in Medical Physics

23th-25th April 2020, Athens, Greece

The EFOMP in collaboration with the Hellenic Association of Medical Physics (HAMP) and the 2nd Department of Radiology, Medical School, National and Kapodistrian University of Athens would like to invite you to the next ESMPE in **Statistics 2020**

The school will be aimed at advanced tasks connected with the use of statistical methods in data handling and interpretation. The school will cover the methods of inferential statistics most frequently used in the medical field, the statistical methods used in radiomics, the treatment of errors an uncertainties in radiation dosimetry.

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in data management and research. As in last year's school, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

Content

Sample Size determination. Sample size determination for different study designs
Evaluation of a diagnostic test– Sensitivity, specificity, diagnostic accuracy, ROC methods
Applied regression analysis. Analysis of variance, Analysis of Covariance, multiple regression, logistic regression
Survival analysis – Relative risks Odds ratio. Survival curves with Kaplan Meyer; Log-rank test; Cox models
Statistical methods in radiomics.
Errors an uncertainties in radiation dosimetry – Theory of error and uncertainty analysis: Type A and B uncertainty, assessment of the quality of a measurement or calculation.
Agreement in Radiotherapy – How to assess agreement in Dose distributions and Volumes

Final exam

The final exam is voluntary. Participants can gain additional credits when successfully pass the test.

Organizers

Marco Brambilla (Scientific Chair)**, Alberto Torresin** (Chair of the School)

Pola Platoni, **Gerasimos Messaris** (HAMP), **Efi Koutsouveli** (ESMPE Board)

Faculty

Marco Brambilla	University Hospital, Novara, Italy
Mathieu Hatt	LaTIM INSERM, Brest, France
Renata Longo	University of Trieste, Trieste, Italy
Brendan McClean	St Luke’s Radiation Oncology Network, Dublin, Ireland
Michael Sandborg	Linköping University hospital, Linköping, Sweden
Peter Sharp	University of Aberdeen, Aberdeen, Scotland
Jeroen van de Kamer	Netherlands Cancer Institute, Antoni van Leeuwenhoek, Amsterdam, The Netherlands
Dimitris Visvikis	LaTIM INSERM, Brest, France
Federica Zanca	Palindromo Consulting, Leuven, Belgium

23th April 2020				
	Session	**Title**	**Description**	**Lecturer**
8:00-9:00	Registration			
9:00-9:15		Introduction	Presentation of the ESMPE	E Koutsouveli
9:15-10:00	Setting the scene	Statistics with Confidence	How to design the experiment How to analyze the data How to report the data: Hypothesis testing or confidence intervals?	M Brambilla
10:00-10:30	Coffee break			
10:30-11:30	Diagnostic test	Evaluation of a diagnostic test. I: Theory	Sensitivity, specificity, diagnostic accuracy, ROC, FROC, AFROC	F Zanca
11:30-12:30		Evaluation of a diagnostic test. I: Worked examples	The practical session will focus on how to lead ROC analyses	F Zanca
12:30-14:00	Lunch break			
14.00-15.00	Applied Regression Analysis	ANOVA, ANCOVA. I Theory	Design of the experiment. One-Way ANOVA; Multiple-way ANOVA (Main effects; Factorial; Repeated Measures). Analysis of Variance Tables	M Brambilla
15.00-16.00		ANOVA, ANCOVA. II Worked Examples	The practical session will focus on how to interpret the results of ANOVA/ANCOVA studies lead in the field of medical physics.	M Brambilla
16:00-16:30	Coffee break			
16.30-17.00	Applied Regression Analysis	Logistic Regression. I Theory	Logistic Function, Logistic Transformation;odds	M. Brambilla
17.00-18.00		Logistic Regression. II Worked examples	Analysing data from visual grading experiments with logistic regression models	M. Sandborg
20:00-23:00	Social dinner - participants + lecturers			

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24th April 2020				
	Session	**Title**	**Description**	**Lecturer**
9:00-10:00	Applied Regression Analysis	Multiple linear regression. I: Theory	Selecting the best regression equation; Strategy for selecting variables; Reliability with split samples. Coefficient of determination, Standardized regression coefficients	R Longo
10:00-10:30	Coffee break			
10.30-11.30	Applied Regression Analysis	Multiple linear regression. II Worked examples	The practical session will focus how on how to lead and interpret multiple regression studies in the field of medical physics.	R Longo
11.30-12.30	Survival Analysis	Survival Analysis. I. Theory	Relative Risks. Odds ratio. Survival curves with Kaplan Meyer; Log-rank Test; Cox Models	P Sharp
12:30-14:00	Lunch time			
14.00-15.00	Survival Analysis	Survival Analysis. II. Worked examples	The practical session will focus how on to build and interpret survival curves	P Sharp
15.00-16.00	Statistical Methods in Radiomics	Workflow and Feature Categories	Image acquisition. Region segmentation. Features extraction. Histogram-based features (first order statistics). Textural features (second order statistics). Higher order statistical features	D Visvikis
16:00-16:30	Coffee break			
16.30-17.30	Statistical Methods in Radiomics	Properties of an ideal radiomics feature and methodology for evaluation	Test-retest data; Compare metrics through different analysis pipelines; quantify and rank statistical correlation between features; improved models	M Hatt
17.30-18.00		Challenges and Limitations	Guidelines to improve the reporting quality and the reproducibility of radiomics studies, as well as the statistical quality of radiomics analyses.	M Hatt

25th April 2020				
	Session	**Title**	**Description**	**Lecturer**
9.00-10.00	Error and Uncertainty analysis in Radiation Dosimetry	Treatment of uncertainties in Radiation Dosimetry. I: Theory	The lecture will go through theory of error and uncertainty analysis: Type A and B uncertainty, Standard deviation of the mean, probability density functions	B McClean
10.00-11.00		Treatment of uncertainties in Radiation Dosimetry. II: worked examples	The practical session will focus on the assessment of the quality of a measurement or calculation; the quantitative comparison of results from different investigators; the critical analysis of measurement or calculation method	
11:00-11:30	Coffee break			
11:30-13:00	Agreement in Radiotherapy	Comparing dose	Comparing measured and calculated dose distributions: distance to agreement, dose difference and gamma evaluation	J van de Kamer
		Comparing Volumes	Determining volume differences by means of DICE, Hausdorff distance	
13:00-15:00	Final examination			

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European Society for Magnetic Resonance in Medicine and Biology

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Further Information

Course language	English
Level	Medical Physics Expert (MPE)
Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner)	300 € 350 € (from 15.03.2020)
Reduced registration fee* • subsidized by EFOMP • first-come, first-served policy • deadline for application (23.09.2019)	150 € - for the first **15** attendees (max. 2 from one country) coming from the following European countries: Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, North Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Turkey, Ukraine.
Maximum number of participants	80
Duration	23th April 2020 – 25th April 2020
Study load	17 hours of lectures and practical demonstrations
Venue	National and Kapodistrian University of Athens (NKUA), Central building, Panepistimiou 30, Athens 106 79
Website:	www.efomp.org
Accommodation	Individual
Information, programme at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	1st September 2019 – 10th April 2020

* payment must be done in 14 days following the pre-registration, otherwise pre-registration will be cancelled and neither free place nor subsidized or ordinary fee can be granted for repeated registration

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Optimisation in X-ray and Molecular Imaging 2020

Third Announcement

Gothenburg, Sweden
20-22 April 2020

Optimisation in X-ray and Molecular Imaging 2020 will cover a wide area of research related to optimisation of medical imaging and is intended for a broad audience of medical physicists, radiologists, nuclear medicine physicians, engineers, radiographers and biomedical scientists, as well as representatives for authorities and manufacturers. The conference is the 5th in a series of scientific conferences focusing on optimisation of medical imaging, with special emphasis on image quality evaluation and radiological protection. Previous conferences have been held in Malmö, Sweden (1999, 2004, 2009) and Gothenburg (2015).

Invited speakers:

Göran Bergström, University of Gothenburg & Sahlgrenska University Hospital, Sweden
How can machine learning advance large population trials? – The Swedish CArdioPulmonary bioImage Study (SCAPIS)

Mika Kortesniemi, HUS Medical Imaging Center, University of Helsinki, Finland
From image quality to care outcome – Evolved optimisation process supported by AI/Deep Learning

Glenn Flux, Royal Marsden Hospital & Institute of Cancer Research, UK
Personalised treatment planning for molecular radiotherapy
Part 1: The Good – Benefits and opportunities
Part 2: The Bad – Risks and threats

Sophia Zackrisson, Lund University & Skåne University Hospital, Sweden
Breast tomosynthesis in screening – From optimization to a large screening trial.
14 years of experience from Malmö, Sweden

Contributions in the following areas are welcome:

- Optimisation in radiology and nuclear medicine
- Assessment of clinical images and observer performance studies
- Recent technological developments and their clinical impact
- Patient dosimetry and reference doses/activities
- Occupational exposure
- Physical measurements and quality assurance programs
- Modelling procedures
- AI and Deep learning in medical imaging
- Image display, monitors and their environment
- Education and training

The conference will include a commercial exhibition.

Submit your abstract at www.oxmi2020.org now!

Sahlgrenska University Hospital, Gothenburg – University of Gothenburg –
Skåne University Hospital, Malmö – Lund University –
Otto von Guericke University Magdeburg – IRS Liverpool –
Swedish Society for Radiation Physics

07/10/2019

General information

Abstract Submission

The deadline for abstracts is 2 December 2019. An abstract template can be found on the conference website. Notification of acceptance will be given before 31 January 2020.

Proceedings

The proceedings of the conference will be published in Radiation Protection Dosimetry. Manuscripts must be submitted in English and comply with the “Instruction for Authors”, which will be sent to the authors together with the notification of acceptance for presentation at the conference. Publication of the manuscripts will be subject to peer review.

Conference Venue

Gothenburg is the second largest city in Sweden with about 500 000 inhabitants. It is located on the west coast of Sweden, well known for its beautiful archipelago, culinary attractions and strong industrial history.

The conference will be held at Conference Centre Wallenberg at University of Gothenburg, a modern, centrally located, and flexible multi-function venue for conferences, meetings and events. The Conference Centre Wallenberg is located close to Sahlgrenska University Hospital.

The international airport in Gothenburg is Göteborg Landvetter Airport (GOT).

Accommodation

A list of hotels in different price ranges can be found on the conference website. You may reserve your accommodation when you register for the conference.

Conference Secretariat / Website

Dughult of Sweden
Gamla Almedalsvägen 29
412 63 Gothenburg
SWEDEN

Phone: +46 31 778 38 00
E-mail: info@oxmi2020.org
Website: www.oxmi2020.org

Registration

The registration fee for the conference is 6000 SEK. The fee covers the scientific programme, proceedings, lunches, get-together party and conference dinner.

The registration form and registration fee must be received by 1 March 2020, by the conference secretariat. Late registration fee is 7500 SEK.

Full-time students, with an accompanying letter from their supervisor, may register at a special student fee, 4000 SEK.

Registration is available on the conference website. All prices are excl. of Swedish VAT at 25%.

Social Programme

A get-together party will be held on Sunday 19 April 2020. The conference dinner is on Tuesday 21 April 2020.

Local Organizing Committee

Jonny Hansson, chair
Jennie Bengtsson , co-chair
Charlotta Lundh, co-chair
Magnus Båth
Johanna Dalmo
Emma Eliasson
Jakobína Grétarsdóttir
Maria Hultenmo
Jehangir Khan
Maria Larsson
Esmaeil Mehrara
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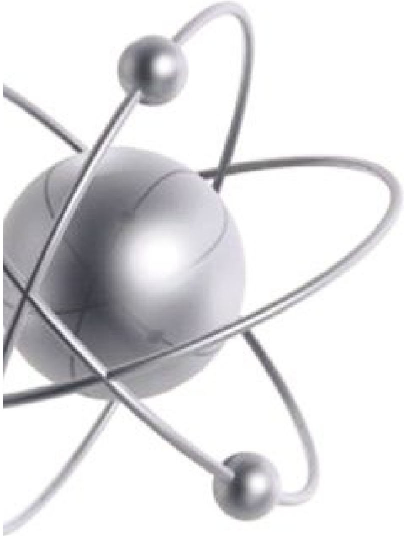
Sören Mattsson, Malmö
Michael Moores, Liverpool, GB
Lars Gunnar Månsson, Gothenburg
Michael Sandborg, Linköping
Anne Thilander-Klang, Gothenburg
Anders Tingberg, Malmö
Martijn van Essen, Gothenburg
Francis Verdun, Lausanne, CH
Eleonor Vestergren, Gothenburg

Others to be confirmed

07/10/2019

Educational Activities 2020

Date	Description	URL	Location
Dec 6th, 2019 - Dec 7th, 2019	1st AICI Forum Villach - Artificial Intelligence in Clinical Imaging	AICI Forum	Villach, Austria
Jan 23rd, 2020 - Jan 25th, 2020	EFOMP - European School for Medical Physics Experts (ESMPE) Statistics edition 2020 Innovation in technology in Nuclear Medicine	EFOMP	Prague, Czech
Jan 23rd, 2020 - Jan 25th, 2020	European School for Medical Physics Experts (ESMPE) Nuclear Medicine edition 2020	EFOMP	Prague, Czech Republic
Feb 7th, 2020 - Feb 8th, 2020	Symposium of Belgian Hospital Physicist Association 2020	BHPA	Belgium
Mar 11th, 2020 - Mar 15th, 2020	European Congress of Radiology 2020	MYESR	Vienna, Austria
Apr 3rd, 2020 - Apr 7th, 2020	ESTRO39	ESTRO	Vienna, Austria
Apr 20th, 2020 - Apr 22nd, 2020	Optimisation in X-ray and Molecular Imaging 2020	OXMI2020	Gothenburg, Sweden
Apr 23rd, 2020 - Apr 25th, 2020	European School for Medical Physics Experts (ESMPE) Satistics edition 2020	EFOMP	Athens, Greece
May 10th, 2020 - May 12th, 2020	NACP2020 Symposium	NACP	Reykjavik, Iceland
May 25th, 2020 - May 27th, 2020	8th MR in RT Symposium	DKFZ	Heidelberg, Germany
May 28th, 2020 - May 30th, 2020	Data Analysis with Python for Medical Physicists	MAMP	Siggiewi, Malta
Sep 24th, 2020 - Sep 26th, 2020	3d European Congress of Medical Physics	ECMP20	Torino, Italy



New!

EFOMP new officers introductory course

Board of Directors
EFOMP board
May 21st, 2019
Size: 305,12 KB

Secretary general
EFOMP board
May 21st, 2019
Size: 254,88 KB

Treasurer
EFOMP board
May 21st, 2019
Size: 219,84 KB

Comm & Publications Committee
CP committee section
May 21st, 2019
Size: 287 KB

Education & Training Committee
ET committee section
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Professional Matters Committee
PM committee section
May 21st, 2019
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Projects Committee
Projects committee section
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Science committee section
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European Medical Physics News

The purpose of the newsletter is to provide a communications forum for medical physics organisations, and for medical physicists, across Europe.

We are always looking for Europe-wide contribution to the EMP News.The editors would like to hear from you! Developments in science, in education and in training are all relevant. Cross-border or international initiatives are particularly of interest, and these can be in any area of physics and engineering applied to medicine. Comparisons between the practice and organisation of medical physics in different countries are particularly welcomed.

If you want to receive the EMP news you can subscribe to our mailing list.

If you would like to advertise in the EMP news please contact the Communications & Publications committee pubcommittee@efomp.org.

Articles should be sent to the Communications & Publications committee pubcommittee@efomp.org.

EMP News Autumn 2019
Sep 6th, 2019
Size: 12,99 MB

EMP News Summer 2019
Jun 4th, 2019
Size: 12,35 MB

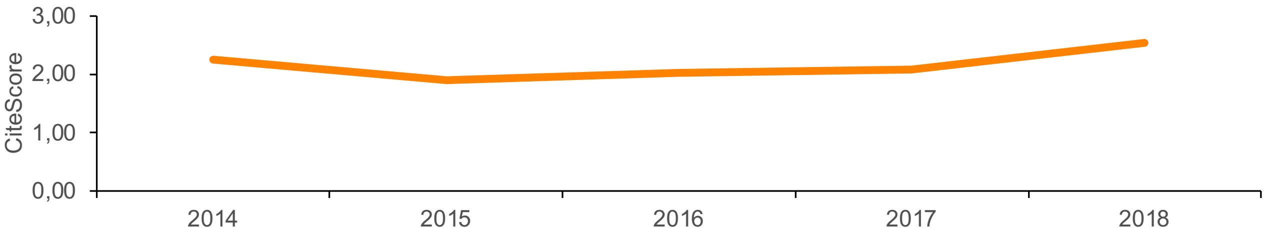
EMP News Spring 2019
Mar 10th, 2019
Size: 16,14 MB

EMP News Winter 2018
Dec 4th, 2018
Size: 24,93 MB

EMP News Autumn 2018
Oct 10th, 2018
Size: 4,76 MB

EMP News Summer 2018
Jul 1st, 2018
Size: 15,68 MB

CiteScore *Physica Medica*



ISSN	Title	2014	2015	2016	2017	2018
11201797	Physica Medica	2.25	1.90	2.03	2.09	2.54

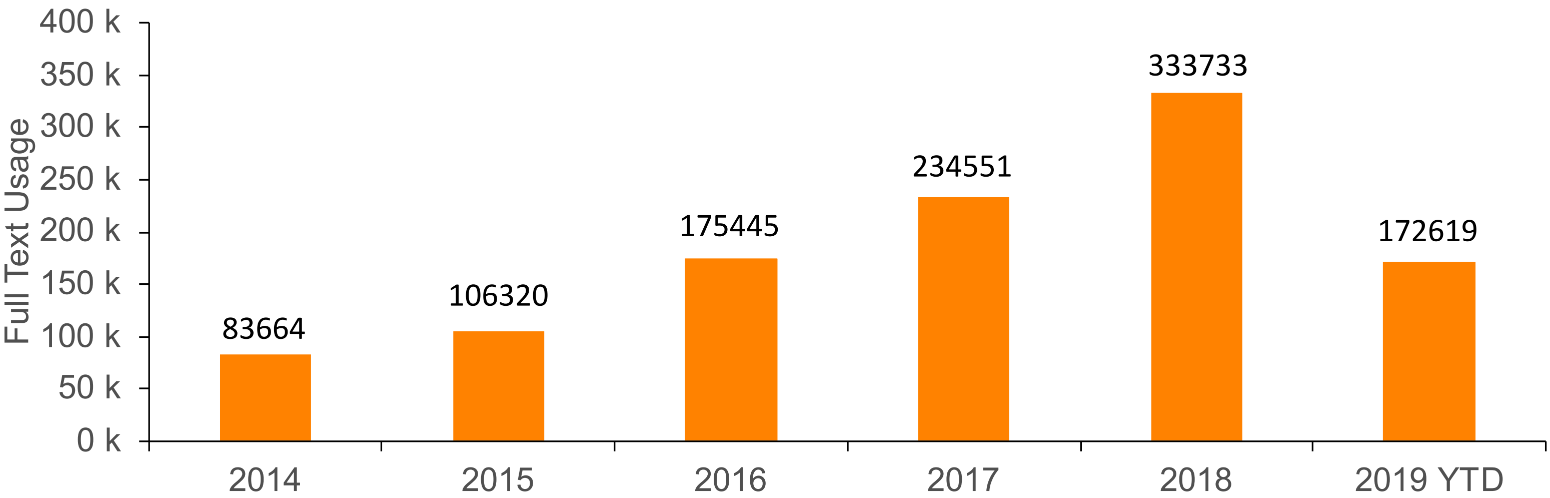
Category	Rank	Total Journals	Quartile
Radiology Nuclear Medicine and imaging	57	272	Q1
General Physics and Astronomy	49	215	Q1
Biophysics	41	125	Q1

CiteScore measures the average citations received per document published in Physica Medica. CiteScore values are based on a citation counts in a given per year (e.g. 2018) to documents published in three previous calendar years (e.g. 2015 – 2017), divided by the number of documents in these three previous years (e.g. 2015 – 2017).

Source: Scopus

Last Updated: Jun 2019

Full Text Usage of Physica Medica per Year



From 2014 to 2019 YTD a total of 1.1 Mio Physica Medica article downloads were made.

SD Latest Month: Jul 2019

Thanks to Efi Koutsouveli!

Dear Efi,

on behalf of all members of the EFOMP Communications and Publications Committee, I would like to express to you our warmest thanks for your relentless activity and hard work in these last three years as Secretary of our Committee.

We appreciated your full dedication and support to EFOMP communications and publications activities.

Paolo Russo

Chair, EFOMP Communications and Publications Committee

European Medical Physics News, 1 December 2019.

Thank you, Efi!

Paolo Russo
Chair, EFOMP Communications and Publications Committee

Paolo Russo, Università di Napoli Federico II, Dipartimento di Fisica, and INFN Sezione di Napoli, Via Cintia, I-80126 Napoli, Italy (phone +39-081-676146, e-mail paolo.russo@na.infn.it)

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Ad Maas

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EFOMP
EUROPEAN FEDERATION
OF ORGANIZATIONS
FOR MEDICAL PHYSICS

The European Federation of Organisations in Medical Physics (EFOMP) was founded in May 1980 in London to serve as an umbrella organisation for medical physics societies in Europe. The current membership covers 34 national organisations which together represent more than 8000 medical physicists and clinical engineers working in the field of medical physics. The moto developed and used by EFOMP to underline the important work of medical physics societies in healthcare is "Applying physics to healthcare for the benefit of patients, staff and public".

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