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ECMP 2022 special issue editorial

The Fourth European congress of medical physics took place in Dublin in August 2022. Over 840 delegates attended the first in person European congress of medical physics since the pandemic. The previous congress in Torino was fully online. Hence, although Covid lingered on albeit with lesser impact this was a welcome and pleasant return to an in-person congress. The Dublin congress was highly innovative with many new aspects, such as an early careers special area and program, a DIY fair to stimulate innovation, and many new types of live interactions through an extensive social program [1,9]. The level of participation at the congress and the scientific contributions were of a high standard with lots of stimulated discussions. The theme of the congress was "*multiple energies single patient focus*". Papers were presented on topics ranging from both highly academic approach to practical clinical implementation. As we anticipate the 2024 and 2026 congresses, we are assured that the European congress of medical physics will maintain and grow its stature as the premium medical physics congress in Europe and a highlight of the global "must attend" medical physics events.

An exciting program based on a number of medical physics streams was selected from a significant number of abstract submissions. The leaders of the different streams have nominated a number of presentations which have led to this selection of high-quality papers to be invited for this special issue. This was not an easy task due to the generally agreed high quality of the submissions, research and presentations.

The papers presented here cover the broad streams in the conference. Some of the selected best presentation papers were not submitted for publication in this special edition. This was primarily due to stage of research that the authors were at during the preparation of this special issue. I had the pleasure of reading the five articles which eventually made full publication. They reflect the value of the congress and its impact on the future of medical physics in Europe. They deal with new approaches as well as new ways to evaluate new technology in both the treatment and diagnosis of disease.

Five papers are selected in this special issue [2–6]:

1. Evaluation of operator eye exposure and eye protective devices in interventional radiology: Results on clinical staff and phantom.

A. D'Alessio , R. Matheoud , B. Cannillo , G. Guzzardi , F. Galbani , A. Galbiati , M. Spinetta , C. Stanca , S. M. Tettoni , A. Carriero , M. Brambilla.

2. Clinical aspects of spatially fractionated radiation therapy treatments

M. P. Grams, C. L. Deufel, J. A. Kavanaugh, K. S. Corbin, S. K. Ahmed, M G. Haddock, S. C. Lester, D, J. Ma, I.A. Petersen, R. R. Finley, K. G. Lang, S S. Spreiter, S. Park, Dawn Owen.

3. Multiscale X-ray phase-contrast tomography: From breast CT to micro-CT for virtual histology

L.M. Arana Peña , S. Donato , D. Bonazza , L. Brombal , F. Martellani , F. Arfelli , G. Tromba , R. Longo .

4. A new formula for converting dose-area product to effective dose in dental cone-beam computed tomography

R. Pauwels.

5. Optically stimulated luminescence system as an alternative for radiochromic film for 2D reference dosimetry in UHDR electron beams

V. Vanreusel , A. Gasparini , F. Galante, G. Mariani , M. Pacitti , A. Colijn , B. Reniers , B. Yalvac , D. Vandenbroucke , M.Peeters , P. Leblans , G. Felici , D. Verellen , L. de Freitas Nascimento.

The first paper [2] deals with the very important area of radiation protection of the eyes in interventional radiology. When the ICRP issued the recommendation on the lower eye dose limit back in 2012 [7], there was a justifiable concern that if adopted as part of the basic safety standard and this would lead to widespread exceedance of limits by many interventional radiologists and cardiologists. Anecdotally, through regulatory contacts, although there have been cases of exceedance and sanction, this has not been as widespread as feared initially.

This could have led to multiple regulatory sanctions as well as reducing the availability of such highly trained clinical operators to sometimes critically ill patient cohorts. Key to both the protection of the operators and to accurate dose estimation is the use of personal protective equipment (PPE). The suggested radio protective effect of such PPE can also be presented by distributors and vendors in a manner that overestimates the actual radiation dose reduction. This can lead to misuse of resources and provide a false sense of security to the operators.

The second paper by Grams et al, [3], explores the clinical implementation of a useful and effective delivery technique for large or radioresistant tumours. This is a very practical paper, based on previous publications and on the experience which gives clinical guidance and some case study examples on a multidisciplinary approach to this technique which is undergoing a renewed interest. It follows the patient journey and offers the reader either a brass grid or volumetric

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modulated arc therapy (VMAT) lattice approach that can be implemented in clinical practice including and describing all relevant aspects needed for such an implementation. Such a seminal paper reflects a patient focussed approach that can bring patient benefits to the bedside in an immediate and accessible manner with due regard for patient safety and minimising detriment to organs at risk.

One of the roles of a conference is to highlight the potentials of new technologies and introduce attendees to the next game changing technology. One of this technology is phase contrast imaging. While research in this field has been done over the last decades, applications to the benefit of patients are still rare. The possibility to use phase contrast CT for virtual histology has the potential to provide gold standard non-invasive diagnosis of abnormal radiological features in a rapid manner across a range of pathologies. Of course we are on the starting point of this journey, and clinical access to such images will require many steps and a new paradigm in image interpretation, Arana Pena et al.'s paper, [4] shows that this is something that can produce not only enhanced quality whole organ breast images (~100 μm) but at the same time comparable resolution to histology of a few micrometres over a few cm of selected tissue (a real time biopsy). To further add to the excitement, the virtual histology can visualise this resolution in three dimensions without destroying the sample unlike conventional 2D histology, this has the potential to reveal diagnostic and pathologic insights not available previously.

Dental radiological imaging procedures account for 26 percent of all procedures worldwide [8]. More recently, there has been a rapid growth in Cone Beam CT (CBCT) with a variation in doses and parameters used to produce such images. EFOMP recently launched a special interest group in dental imaging to reflect the increasing involvement of medical physicists in optimising this new technology for patient benefits and the fact that there has been no focussed medical physics group dealing with this topic in a European context. Effective dose equivalent has many limitations as a risk-based parameter that are well discussed in many forums. Despite this fact, it is still useful and widely quoted in comparison of risks, justification, technologies and estimation of population dose. In Pauwels paper [5] "a new formula for converting dose-area product to effective dose in dental CBCT", there is a modelling of organs and effective doses and presentation of easy to use formulas. The results here have less uncertainty than methods presented in previous papers. For those of us involved as medical physics experts in dental imaging, the results are useful in optimisation of equipment, risk communication and technique selection.

In the final paper by Vanreusel et al. [6] the possibility of using established dosimetry technology as an alternative to the only current technique for FLASH radiotherapy is explored . The authors cite challenges in dosimetry as being a barrier that inhibits wide spread use of FLASH radiotherapy. The established radiochromic approach has a number of drawbacks including time to processing. In this innovative approach, a semi-flexible sheet was coated with a dedicated phosphor of BaF(Br,I):Eu and scanned with an adapted computed radiography reader . The results showed good accuracy comparison for various dependent parameters . The optically stimulated dosimetry approach overcomes some of the limitations of the radiochromic approach.

For those of us fortunate to have attended and been involved on many levels both organisational and scientific at the Fourth European congress of medical physics, we are proud of the contribution that this congress has made to European medical physics. This special issue of Physica Medica dedicated to the congress reflects the high quality and the multiple energies single patient focus theme of the congress as well as the special role that the European Journal of medical physics has for EFOMP. From horizon scanning to practical implementations the five papers here represent the value of such congresses and why we as a community should attend and present our best work. Also all of the papers presented here have an application across the range of medical physics from diagnostic to interventional to nuclear medicine to radiotherapy and physiological measurement.

Having been involved in the fifth European congress of medical physics in Munich September 2024 organisation and looking forward to the sixth congress in Valencia in 2026, we believe that this has built upon the success of the Dublin congress and the impact on European medical physics will increase EFOMPs ambition to benefit healthcare through the application of physics and to communicate, integrate and educate.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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