

# EDUCATIONAL RESOURCES

## GLOBAL NUMBER OF MEDICAL PHYSICISTS AND ITS GROWTH 1965-2015

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**Abstract—** The paper presents the global growth of medical physicists during the period 1965-2015, supported by the archive data of IOMP ([www.iomp.org](http://www.iomp.org)). Medical physicists work in various institutions and thus it is not possible to have their exact global number, but the available IOMP data gives a good estimate and presents the distribution of medical physicists in different continents. The growth of the profession is discussed as strongly linked with the Education and Training activities in medical physics. Based on the recent (2015) report of the Global Task Force on Radiotherapy for Cancer, further activities are discussed to reflect the expected significant need of more medical physicists by 2035.

**Keywords—** Medical Physics Professional development, Education and Training, e-Learning

### I. INTRODUCTION

Medical physicists have a very important role in contemporary medicine, associated with the clinical application of all medical imaging and radiotherapy equipment. This way it is only natural to see increasing of medical physicists with the increased use of this equipment.

Medical physicists work mainly in hospitals, but also in Universities, Research Institutions, Regulatory bodies, Industry, etc. Due to this reason it is not possible to establish the exact global number of medical physicists. However, the data from various medical physics societies, collected by the International Organization for Medical Physics (IOMP), presents a good estimate of this number. The IOMP archive data on Fig.1 shows the growth of the profession in the past 50+ years.

### II. GLOBAL NUMBER OF MEDICAL PHYSICISTS 1965-2015

The history of IOMP has been subject of previous publications [1, 2]. For the purposes of this paper we shall make a brief summary here below. IOMP has been formed in 1963 by 4 National Organisations – from the

UK, USA, Canada and Sweden. In the next two years new Medical Physics Societies joined the Organization – namely from East Germany (DDR), Hungary, Israel, Poland and South Africa. As per the IOMP data, around the time of IOMP formation there had been about 6,000 medical physicists globally. Outside this statistics would be professionals in countries where medical physics societies had not yet been formed, as well as non-members of national societies, hence it would not be possible to have an accurate number of the medical physicists globally at this period.

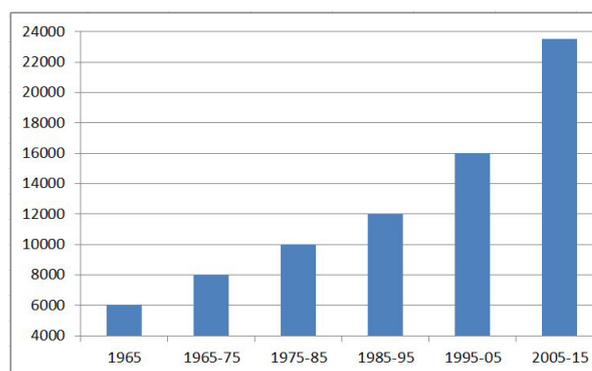


Fig.1 Growth of medical physicists globally in the period 1965-2015 – per decade (IOMP data)

Further, IOMP data shows that during the first decade of the Organization (1965-1975) the global number of medical physicists (members of national societies) increased to about 8,000. During this period new national societies joined IOMP – namely: West Germany, Brazil, Finland, France, Greece and Mexico.

In the next decade 1975-1985 the global number of medical physicists (members of national societies) increased to about 10,000. During this period the new national societies joining IOMP are from: Netherlands, New Zealand, Ireland, Norway, Italy, Japan, Spain,

Austria, Belgium, Denmark, India, Switzerland and Thailand.

The growth of approximately 2,000 professionals per decade continued also in the next period 1985-1995, when the global number of medical physicists (members of national societies) increased to about 12,000. This was one of the most active decades of IOMP, with 30 new member societies joining the Organization (although some are from small countries, and one is uniting two existing societies – Germany). The new national societies joining IOMP in this decade were from: Nigeria, People's Republic of China, Columbia, Turkey, Australia, Hong Kong, Philippine, Sri Lanka, Malaysia, Cyprus, Argentina, Bulgaria, Ghana, Republic of Korea, Romania, Yugoslavia, Tanzania, Germany (united); Moldova, Pakistan, Russia, Slovenia, Sudan, Trinidad & Tobago, Algeria, Indonesia, Iran, Jordan, Panama, Venezuela, Zimbabwe. This way about 30 years after the formation of IOMP the global number of medical physicists doubled.

The period 1995-2005 included 18 relatively small new member societies to the IOMP family – namely from Cuba, Estonia, Georgia, Lithuania, Morocco, Ukraine, Zambia, Ecuador, Portugal, Bangladesh, Chile, Egypt, Nepal, Republic of Taiwan, Singapore, Uganda, Mexico and Mongolia. However in this period the growth per decade doubled (to 4000) and by 2005 the global number of medical physicists reached about 16,000. This period also marks extensive development of medical physics education and training. Many countries established new MSc (or related) University courses. For example, after the International Conference in Medical Radiation Physics Post-graduate Education (Budapest, 1994, [3]) almost all countries from Eastern Europe developed their own medical physics education courses. Also during this period was the introduction of e-learning in medical physics and the opening of a number of educational web sites [4]. Obviously this has influenced the professional growth. This argument is supported by the developments in the next decade.

The strong emphasis on education and training continued also in the decade 2005-2015 [5]. The number of new member societies joining IOMP in this period was relatively small, from: Croatia, Cameroon, Czech Republic, Arab Emirates, Macedonia, Lebanon, Peru, Qatar, Saudi Arabia, Vietnam and Iraq. However the global growth of medical physicists was the largest so far – close to 6000 per decade. During 2016 the global number of medical physicist reached 24,000. This is doubling of this number in the past 20 years. This way about 50 years after its establishment IOMP data shows quadrupling of medical physicists globally. During this period the strongest growth of the profession was in Asia (over 120% increase) and this was supported by many Educational Workshops (including two large ones,

satellite to the World Congresses in Sydney and Seoul, focused on establishment of MSc courses). As a further argument for the importance of education, we have to underline that half of all medical physicists are from USA and UK - members of the AAPM and IPEM – the largest medical physics societies with best developed education, training and professional development.

During this decade e-learning in medical physics developed very strongly and availability of teaching materials through Internet supported many colleagues from low-and-middle income countries [5]. These colleagues also received strong support from the ICTP International College on Medical Physics, where in the period after 1999 about 1000 medical physicists from 82 such countries passed intensive courses [6]. All these colleagues received free e-learning and other teaching materials, which had allowed them to start courses in their own countries. Currently about 20 new MSc courses have been established by graduates of the ICTP College. This was also supported by the IOMP Model Curriculum and the special Guides of the IAEA.

### III. CURRENT GLOBAL DISTRIBUTION OF MEDICAL PHYSICISTS AND PREDICTIONS OF THE GLOBAL TASK FORCE ON RADIOTHERAPY FOR CANCER

The approximate distribution of medical physicists around the world is quite uneven, as shown in Fig. 2, where the number is shown per IOMP Regional Organisations (Federations, formed by IOMP to support the profession in their continents/regions). Obviously additional work is necessary to support the increase of medical physicists in Latin America and Africa. A number of projects are supporting the professional development in these continents, especially through the IAEA, which developed packages of materials and Guides for education and training courses [7]. To help with the dissemination of education, training and professional related information, IOMP launched in 2013 a special free online e-Journal Medical Physics International ([www.mpijournal.org](http://www.mpijournal.org)), which quickly established itself as one of the most accessed Journals in the profession. Further, IOMP formed in 2015 a new body – Regional Coordination Board, aiming to assist the international coordination of the efforts for harmonised development of the profession. The Board includes the leads of all Regional Organisations (Federations) of IOMP and the largest medical physics societies.

These concerted activities will be very important for the coming two decades, where we shall have to expect further very strong increase of the global number of medical physicists. The recently published report [8] of the Global Task Force on Radiotherapy for Cancer estimates that, only for the needs of Radiotherapy by

2035, the global number of newly trained medical physicists will be of the order of: 17,200 (for High-income countries); 12,500 (for Upper-middle-income countries); 7,200 (for Lower-middle-income countries); 2,400 (for Low-income countries). Adding the needs of Medical Imaging will result in approximately tripling the number of medical physicists in the coming two decades (2015-2035).

#### IV. CONCLUSION

The huge challenge, shown in the previous paragraph, will need special attention and actions. In the first place this will be the further development of education and training – something of special importance for a dynamic profession such as medical physics. We as profession will need to specially emphasize activities as sharing teaching expertise and materials, developing of new e-learning activities and more effective education methodologies [9]. Another very important action is continuing discussions in all IOMP Regional Organizations on the subject – such as Topical Conferences, Workshops and other activities. The new IOMP activity, satellite to the ICMP2016 – IOMP School, is an existing step in this direction. Further this can be supplemented by the establishment of Regional Training Centres, what would be of great help especially for smaller countries. The activities of ICTP can be used as a model in such development.

Today it is impossible to even imagine contemporary medicine without the sophisticated Medical Imaging and Radiotherapy equipment. Due to this reason, when the high-level UNESCO World Conference “Physics and Sustainable Development” (Durban, South Africa, 2005) discussed the main topics of applied physics in the 21st century, one of the highlighted topics was ‘Physics and Health’ (presented by IOMP). This way increasing the medical physics workforce is not simply a professional need, it is also of main importance for the development of global healthcare.

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