review

Medical physics in Europe following recommendations of the International Atomic Energy Agency

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Background. Medical physics is a health profession where principles of applied physics are mostly directed towards the application of ionizing radiation in medicine. The key role of the medical physics expert in safe and effective use of ionizing radiation in medicine was widely recognized in recent European reference documents like the European Union Council Directive 2013/59/EURATOM (2014), and European Commission Radiation Protection No. 174, European Guidelines on Medical Physics Expert (2014). Also the International Atomic Energy Agency (IAEA) has been outspoken in supporting and fostering the status of medical physics in radiation medicine through multiple initiatives as technical and cooperation projects and important documents like IAEA Human Health Series No. 25, Roles and Responsibilities, and Education and Training Requirements for Clinically Qualified Medical Physicists (2013) and the International Basic Safety Standards, General Safety Requirements Part 3 (2014). The significance of these documents and the recognition of the present insufficient fulfilment of the requirements and recommendations in many European countries have led the IAEA to organize in 2015 the Regional Meeting on Medical Physics in Europe, where major issues in medical physics in Europe were discussed. Most important outcomes of the meeting were the recommendations addressed to European member states and the survey on medical physics status in Europe conducted by the IAEA and European Federation of Organizations for Medical Physics.

Conclusions. Published recommendations of IAEA Regional Meeting on Medical Physics in Europe shall be followed and enforced in all European states. Appropriate qualification framework including education, clinical specialization, certification and registration of medical physicists shall be established and international recommendation regarding staffing levels in the field of medical physics shall be fulfilled in particular. European states have clear legal and moral responsibility to effectively transpose Basic Safety Standards into national legislation in order to ensure high quality and safety in patient healthcare.

Key words: medical physics; Europe; International Atomic Energy Agency; recommendations; basic safety standards

Introduction

Medical physics is a dynamic and constantly growing field of applied physics mainly directed towards the application of physics principle to health care in order to ensure safety and quality in diagnostic and therapeutic procedures involving the application of ionizing radiation. Medical physics traditionally covers four main areas of applied physics in medicine:

1. Diagnostic and interventional radiology physics
2. Radiation oncology/radiotherapy physics

3. Nuclear medicine physics
4. Radiation protection physics sometimes referred also as health physics

Within these four subspecialties, medical physicists are involved in four basic activities: clinical service, research and development, teaching and management/administration. Although mentioned specialties of medical physics cover almost completely the area of medical physics profession, medical physicists are and where appropriate should be involved in other applications of physics in medicine as well, such as ultrasound imaging, magnetic resonance imaging, bioelectrical investigation of the brain and heart (electroencephalography and electrocardiography), bio magnetic investigation of the brain (magneto encephalography) applications of lasers in medicine and medical informatics.[1] Within the present discussion we limit ourselves to the application of ionizing radiation to medicine.

Over hundred years ago three major events opened doors of medicine to applied radiation physics: discovery of x rays by Wilhelm Conrad Roentgen in 1895, discovery of natural radioactivity by Henry Becquerel in 1896 and discovery of radium by Pierre and Marie Curie in 1898, followed in 1934 by the discovery of artificial radioactivity by Irene Curie and Frederic Joliot, resulting from the creation of short-lived radioisotopes from the bombardment of stable nuclides and the advances in radar and radiofrequency technology during World War II that made linear accelerators development possible. Since then physics has started to play an important role in medicine for routine use of ionizing radiation in medical diagnostic and therapy. Over the last few decades we were witnessed of enormous development of radiation medicine, mainly through the technological development of the equipment which is used for accurate diagnostic or therapeutic procedures: optimization of image quality for computed tomography and magnetic resonance imaging, development of radiation therapy equipment (high energy linear accelerators with sophisticated options for dose delivery, computerized treatment planning systems, record and verify systems, etc.) and overall integration of computers into the routine clinical work. This is reflected in the huge increase of medical radiological procedures in the world; presently there are around 4 billion x-ray examinations, 35 million nuclear medicine examinations and 5 million radiotherapy courses undertaken annually.

Such tremendous development has triggered demands and need for more highly educated and well trained medical physicists. Introduction of formal systems for education and clinical training became crucial and many universities in Europe offer academic programmes in medical physics. However, there is still a lack of accredited clinical training programs in the majority of countries in Europe. Although international and European professional medical physics organizations together with European Commission (EC) and International Atomic Energy Agency (IAEA) have undertook efforts to raise awareness of national authorities across Europe regarding the role and the importance of medical physics in radiation medicine it seems, that these efforts have not been fully successful. There is still no harmonization and full recognition of medical physics profession in Europe, there is still shortage of well-educated and clinically trained medical physicists, there are still lack of educational frameworks and structured clinical training programmes in several European countries, there are difficulties to implement continuous professional development (CPD) systems and unfortunately, there are still reports and news about incidents and accidents in the field of radiation medicine.[2-8]

This review has no intention to cover current status of medical physics in Europe, neither has the ambition to discuss medical physics history or its future perspectives and importance in radiation medicine. The subject is far too broad and complex and it is described and discussed in depth in general medical physics textbooks and international literature.[9-11]

The main purpose of this paper is to present comments on most recent recommendations from the IAEA after the *"Regional Meeting on Medical Physics in Europe: Current Status and Future Perspectives"* held in Vienna from 7th to 8th May 2015. Invited representatives - over 60 from more than 30 European countries - from World Health Organization (WHO), international professional organizations and societies (International Organisation for Medical Physics – IOMP, European federation of Organisations for Medical Physics – EFOMP and European Society for Radiotherapy and Oncology – ESTRO) , national regulatory bodies and Health Ministries and representatives of medical physicists, were discussing the current status and future perspectives of medical physics in Europe.[12]

The recommendations of the IAEA Regional Meeting, serving as an outcome of the meeting, are presented in original form and are the bases of the paper, while notes and observation from the same document were omitted due to the journal space considerations.[13]

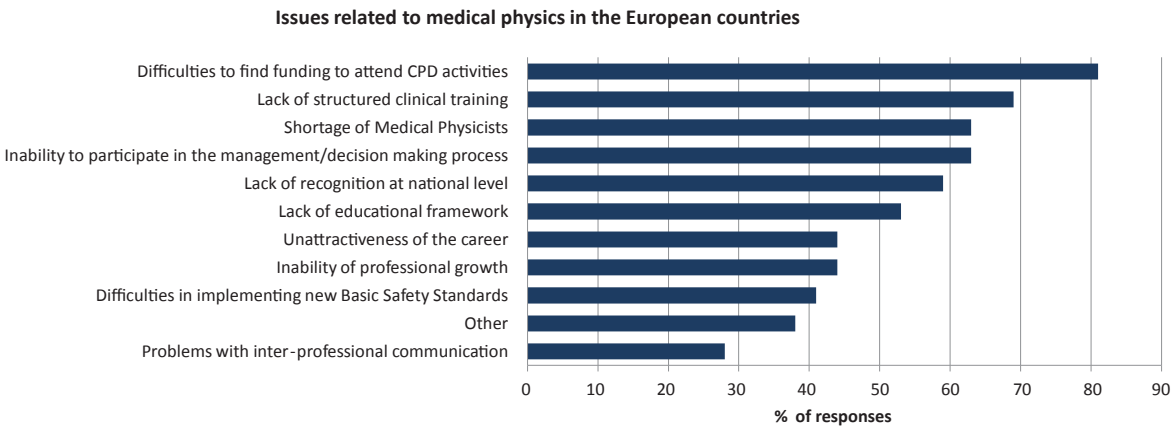

FIGURE 1. Issues/difficulties in medical physics identified in IAEA/EFOMP survey in 2015 (Damilakis J, Lopes M. C. Overview of medical physics status and future prospects: Results of survey in Europe. "Regional meeting on Medical Physics in Europe: Current Status and Future Perspectives", IAEA 7th -8th May 2015). Survey has revealed pronounced problems in several issues: difficulties to find funding to attend continuous professional development (CPD) activities, lack of structured clinical training, shortage of medical physicists, inability to participate in the management/decision making process, lack of recognition and lack of educational framework, were appointed by more than 50% of the 32 respondent countries to be felt problems concerning medical physics.

For each of seven IAEA recommendations, it has been tried to find justifications for and rationales behind the recommendations as well as to limited extent also legislative backgrounds, mostly within recently published international documents and basic safety standards (BSS) – European Union Council Directive 2013/59/EURATOM (EU BSS Directive), European Commission RP 174 *European Guidelines for Medical Physics Experts* (EC RP 174), IAEA Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (IAEA IBSS) and IAEA Human Health Series No. 25, *Roles and Responsibilities, and Education and Training Requirements for Clinically Qualified Medical Physicists* (IAEA HHS 25).[14-17] Although the citations from various documents are presented only fragmentally, they provide sufficient information about the solid background of presented recommendations of the IAEA Regional Meeting regarding the medical physics profession in the Europe region.

Recommendations have additional basis in the convincing and unambiguous results of the survey on medical physics status in Europe conducted by the IAEA and EFOMP in 2015 (Figure 1).[18]

Recommendations of the IAEA Regional Meeting on medical physics in Europe

"Recalling the provisions of "Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards" (General Safety Requirements Part 3, IAEA 2014) regarding the role of medical physicists in ensuring safety in diagnostic and therapeutic procedures involving application of ionizing radiation, the Meeting recommended that Member States of the Europe Region should fully recognize Clinically Qualified Medical Physicist[A] (CQMP) as a health professional with specialist education and training in the concepts and techniques of applying physics in medicine and competent to practice independently in one or more of the subfields (specialties) of medical physics

The Meeting also recommended that Member States of the Europe Region should, in particular:

1. **Recognize** medical physics as an independent profession in health care with radiation protection responsibilities, as given in the "Joint position statement by the IAEA and WHO – Bonn call for action";
2. **Ensure** that medical physics aspects of therapeutic and diagnostic procedures, including patient and equipment related tasks and activities are performed by CQMPs or under their supervision;
3. **Establish** the appropriate qualification framework for CQMPs including education, specialized clinical training, certification, registration

[A] The term "**clinically qualified medical physicsts**" was defined in Roles and responsibilities and Education and training Requirements for Clinically Qualified Medical Physicists, IAEA Human Health Series No. 25, IAEA 2013 corresponds to "**qualified expert in medical physics**" defined in the IAEA International Basic Safety Standards and the "**medical physics expert**" defined in the European Council Directive 2013/59/EURATOM

and continuing professional development in the specializations of medical physics, i.e. diagnostic and interventional radiology, radiation oncology and nuclear medicine;
4. **Follow and fulfil** international recommendations regarding the staffing levels in the field of medical physics;
5. **Establish** mechanisms for medical physics services integration in all centres practicing radiation medicine, and establish, where appropriate, independent medical physics departments in which accredited clinical training can take place;
6. **Promote** involvement of CQMPs in hospital governance boards and relevant national health committees;
7. **Establish and enforce** the legislative and regulatory requirements related to radiation safety in medical imaging and therapy where medical physics is concerned, in accordance with the international and, where applicable, European basic safety standards."

Recognition of medical physics as independent health profession

In 2012 the IAEA, co-sponsored by WHO, held the "*International Conference on Radiation Protection in Medicine: Setting the Scene for the Next Decade*" in Bonn, Germany. The specific outcome of this conference was the published document *"Joint position statement by the IAEA and WHO – Bonn call for action"*[19], where some actions were identified as being essential for the strengthening of radiation protection in medicine over the next decade. Regarding the strengthening of radiation safety culture in health care, Action 8f: says the following: *"Work towards recognition of medical physics as an independent profession in health care, with radiation protection responsibilities"*.

Furthermore in the IAEA IBSS[16], medical physicist is defined as *"A health professional with specialist education and training in the concepts and techniques of applying physics in medicine and competent to practice independently in one or more of the subfields (specialties) of medical physics"*.

Through the committed efforts of the IOMP and other organizations, medical physicists have been included for the first time, in 2008 in "The international Standard Classification of Occupations (ISCO.08)".[20,21] Medical physicists are classified under the group 2111, "Physicists and Astronomers" but 5 out of 11 enumerated tasks concern explicitly medical physicists.[B]

There is also an explicit note of 2111 group stating *"… medical physicists are considered to be an integral part of the health work force alongside those occupations classified in sub-major group 22, Health professionals"*. On the other hand, under the group 22 of "Health professionals" also a specific note is included saying that "*it should be noted that a number of professions considered to be a part of the health work force are classified in groups other than sub-major group 22, Health professionals. Such occupations include but are not restricted to: addictions counsellors, biomedical engineers, clinical psychologists and* ***medical physicists.***"

Mentioned statements and definitions from quoted documents give unambiguous justification for the first recommendation of the IAEA Regional Meeting. The recognition of medical physicists as a health profession is of paramount importance and should be reflected at the national level (list of recognized professions, legal and fiscal environment, involvement in hospital governance etc.).

Roles and responsibilities of medical physics experts

Recommendation No. 2 clearly emphasizes the role and responsibilities of medical physics expert (MPE) in the fields of medical diagnostic and therapeutic procedures. In the new EU BSS Directive[14] from 2013, MPE is mentioned in 9 articles, while in the former EU BSS Directive[22] from 1997, MPE was mentioned only in 2 articles. New EU BSS Directive[14] thus recognizes the importance and growing role of medical physics profession in Europe. In Article 83 of the directive definitions are found of roles and responsibilities of MPE which are required to be implemented by the EU Member states:

"Member States shall ensure that depending on the medical radiological practice, the medical physics expert takes responsibility for dosimetry, including physical measurements for evaluation of the dose delivered to the patient and other individuals subject to medical exposure, give advice on medical radiological equipment, and contribute in particular to the following:

[B] "(e) ensuring the safe and effective delivery of radiation (ionising and non-ionising) to patients to achieve a diagnostic or therapeutic result as prescribed by a medical practitioner; (f) ensuring the accurate measurement and characterization of physical quantities used in medical applications; (g) testing, commissioning and evaluating equipment used in applications such as imaging, medical treatment and dosimetry; (h) advising and consulting with medical practitioners and other health care professionals in optimizing the balance between the beneficial and deleterious effects of radiation; … (j) developing, implementing and maintaining standards and protocols for the measurement of physical phenomena and for the use of nuclear technology in industrial and medical applications;"…

(a) optimisation of the radiation protection of patients and other individuals subject to medical exposure, including the application and use of diagnostic reference levels;

(b) the definition and performance of quality assurance of the medical radiological equipment;

(c) acceptance testing of medical radiological equipment;

(d) the preparation of technical specifications for medical radiological equipment and installation design;

(e) the surveillance of the medical radiological installations;

(f) the analysis of events involving, or potentially involving, accidental or unintended medical exposures;

(g) the selection of equipment required to perform radiation protection measurements;

(h) the training of practitioners and other staff in relevant aspects of radiation protection;"

It is evident that the tasks described in the EU BSS Directive[14] impose indispensable role and responsibility of medical physics experts and can only be performed by experienced medical physicists with high level of competence. Article 79 of the directive specifically requires from member states to ensure arrangements for the recognition of medical physics experts.

One of the most important requirements from the new EU BSS Directive[14] is that MPE shall be involved in all three major clinical fields of radiation medicine: radiotherapy, nuclear medicine and diagnostic and interventional radiology.

The document IAEA HHS 25[17], published by IAEA in 2013 and endorsed by IOMP and American Association of Physicists in Medicine (AAPM), defines appropriately and unequivocally the roles and responsibilities of CQMP in the different specialties of medical physics and recommends minimum requirements for their academic education and clinical training, including recommendations for their accreditation, certification and registration, along with continuing professional development.

The main goal of all these documents and recommendations is to establish criteria that support the harmonization of education and clinical training, as well as to promote the recognition of medical physics as a health profession.

Establishment of the appropriate qualification framework

European commission has recently published guidelines for medical physics expert – EC RP 174.[15] In this document detailed qualification framework (QF) for MPE in Europe is presented and discussed. QF for medical physicists in Europe should be referred to the European Qualification Framework (EQF) for lifelong learning, laid down by the European parliament and council of the European Union with learning outcomes expressed as inventories of Knowledge, Skills and Competences (KSC).[23] Education and clinical training requirements for medical physicists are discussed comprehensively in the IAEA HHS 25.[17] In depth description and guidance on clinical training of medical physicists specializing in radiation oncology, diagnostic and interventional radiology and nuclear medicine can be found in the IAEA *Training Course Series*.[24-26] Education and training of medical physicist in Europe is also covered in the EFOMP Policy Statement No. 12.[27] According to these documents, appropriate QF for medical physicists should consist of adequate education, accredited clinical training in hospitals and CPD programmes in place.

In the IAEA IBSS[16] similar accent is given already within the definition: "**medical physicists** is *a health professional with specialist education and training in the concepts and techniques of applying physics in medicine and competent to practise independently in one or more of the subfields (specialties) of medical physics*." and further defines that "**qualified expert** *is an individual who, by virtue of certification by appropriate boards or societies, professional licence or academic qualifications and experience, is duly recognized as having expertise in a relevant field of specialization, e.g. medical physics, radiation protection, occupational health, fire safety, quality management or any relevant engineering or safety specialty."*

From the definitions in IAEA IBSS[16] it can be deducted that **qualified expert in medical physics (i.e. MPE)** is a health professional having officially recognized specialization in one or more fields of medical physics.

Regarding the subject discussed in this section, new EU BSS Directive[14] requires from European Union member states in Article 14, point 2 the following: "*Member States shall ensure that arrangements are made for the establishment of education, training and retraining to allow the recognition of radiation protection experts and medical physics experts, as well as occupational health services and dosimetry services, in relation to the type of practice*." Also EC RP 174[15] presents as the first of the seven final recommendations that "*Each Member State should consider designating, through a legal instrument, a Competent Authority specifically for the recognition of the MPE*". And recom-

mendation No. 3 of EC RP 174[15] clearly links recognition to a proper qualification framework as stated: "*The Competent Authority designated for the recognition of the MPE, should use the Qualifications Framework and KSC of the MPE specified in the present document, for the recognition of the MPE to Level 8 of the EQF.*"

Within this frame, recognition of MPE encompasses also certification and registration of an individual professional. Certification is the formal process by which an authorized body evaluates and recognizes the knowledge and proficiency of an individual, which must satisfy pre-determined requirements or criteria. The process must thus always be based on a proper qualification framework involving both education and clinical training. Professional certification of medical physicists should be formally conducted by competent national boards - designated governmental body or alternatively national medical physics organization authorized by the government. In either case, members of such boards shall be predominantly senior MPEs in order to ensure competency in assessment and decision making procedures. The process of certification should be followed by formal registration of medical physics professionals and the register should be operated at the national level by an official authority (e.g. Ministries of health) or professional medical physics society/organization if an official authorization is given by the government. Re-certification system should be established as well in order to maintain high level of proficiency of medical physics experts (EQF level 8). This is usually achieved via formal CPD programme which should ensure up to date KSC of an individual professional. It is evident that without appropriate education, clinical training and CPD system, it cannot be expected medical physics service to play effective role in radiation medicine. However, in order to have a transparent system of certification and re-certification for MPEs, it needs to be consistent with the certification and recognition system of other health professionals/specialists (physicians, dentists) and Ministries of health have to play a key role in this process.

Situations where a formal QF system is not established yet, are mentioned in IAEA IBSS[16] (footnote under definition of medical physicist): "*Competence of persons is normally assessed by the State by having a formal mechanism for registration, accreditation or certification of medical physicists in the various specialties (e.g. diagnostic radiology, radiation therapy, nuclear medicine). States that have yet to develop such a mechanism would need to assess the education, training and competence of any individual proposed by the licensee to act as a medical physicist and to decide, on the basis of either international accreditation standards or standards of a State where such an accreditation system exists, whether such an individual could undertake the functions of a medical physicist, within the required specialty.*"

In countries where the desirable qualification system is not (completely) implemented yet, adequate mechanisms for transition period should be established in order to recognize and certify experienced professionals who have been already continuously employed in the field of medical physics for a specific period.[13] In such cases, the certification through an international or European instance may be a solution. In this concern EFOMP has given recognized steps to fostering education and training on a European level, encouraging the establishment of national training centres, networking and cooperative actions within European projects (e.g. EUTEMPE.RX) that may be taken as facilitators towards European certification process.[28]

Moreover, senior professionals who have been working for a longer period on active duty as medical physicists and are in possession of the core KSC of medical physics should be deemed to satisfy the requirements for recognition as an MPE. For these professionals a **"grandparenting clause"** might and shall be applied and they should be recognized/certified by competent authorization board as MPEs and not required to meet new legislative, educational or training (specialization) requirements.

Staffing levels in the field of medical physics

Fulfilment of the recommendation regarding the staffing levels in the field of medical physics is of major importance if high quality radiation health care service is to be ensured and the risk of radiological incidents and accidents reduced. Among many reports about incidents/accidents published within the last two decades, several of them can be attributed to shortage of experienced medical physicists.[3,4] Many national and international recommendations and other publications regarding the staffing levels in medical physics were published in the past.[29-35] Most recent documents about staffing levels for all subspecialties of medical physics have been published as Annex 2 of EC RP 174[15] and Staffing in Radiotherapy: An Activity Based Approach IAEA Human Health Reports No. 13 (2015).[36]

Despite all recommendations, there is still unacceptable understaffing in the field of medical physics in many European countries.[18] *Call for action* is addressed to the national authorities (e.g. Ministries of health) and hospital's management to incorporate recommendations regarding medical physics staffing levels into national legislations and standards in close cooperation with professional societies and organizations. Insufficient number of qualified and competent medical physicists – MPEs - will result in lower level of health care, even if requests, recommendations and standards from EU BSS Directive[14] and IAEA IBSS[16] will be formally transposed into national legislations.

Independent medical physics departments

EU BSS Directive[14] defines MPE as: "*medical physics expert means an individual or, if provided for in national legislation, a group of individuals, having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to medical exposure, whose competence in this respect is recognised by the competent authority.*" In this context "group of individuals" clearly means group of medical physics professionals (e.g. medical physics departments) with appropriate knowledge, skills and competencies in relevant medical physics specialization fields.

It seems reasonable that medical physics service is governed by the size, type and specific needs of the medical facility. In large hospitals medical physicists are often organized into an autonomous medical physics department which provides services to the various clinical departments e.g. diagnostic and interventional radiology, radiation oncology/radiotherapy and nuclear medicine.[17] If at least two major medical physics subspecialties are required for clinical work in hospitals, autonomous and independent medical physics departments shall be established as appropriate with well-defined safety and quality management system.[37] In many large European hospitals independent medical physics departments have been already established. Examples from developed countries are Institute Gustave Roussy in Paris and Royal Marsden Hospital in London and from less developed countries University Clinical Centre in Sarajevo, which offer services to various clinical departments. Such medical physics departments should competently cover also the field of radiation protection as the fourth major specialty where medical physicists have clear responsibilities, roles and competency.

The added value of a medical physics departments is multiple folded and can be shown through clinical and economic indicators in terms of efficiency and profitability, services quality, improved patient safety and patient satisfaction, increased patient throughput, improved communication and moral of professionals and reduce costs and liabilities. Accredited clinical training for medical physicists and other health professionals (clinicians, technologists, and nurses) is also promoted through such organizational structures that may be constituted as accredited clinical training centres by competent authorities. Importance of integrated medical physics departments was recognized by EFOMP already more than two decades ago in EFOMP Policy No. 5.[38]

Involvement of MPEs in hospital governance boards

EFOMP has recently published Policy statement no. 15, where guidelines on the role of the medical physicist within the hospital governance board are laid down.[39] Explicit recommendation is given regarding the involvement of medical physicists in hospital governance board: *"EFOMP recommends that National Member Organisations encourage their Medical Physicists to be closely involved in hospital governance and, where this has not already happened, to seek membership of their hospital's governance boards and its committees, emphasising the importance of such membership for the good of the patients and the hospital as a whole."*

Involvement of medical physicists in the hospital governance is presently very limited across Europe and often they are not officially included in management and decision making processes (Figure 1).

We have entered the era of fragile and sensitive economy with constantly growing demands for higher quality and safer health care system especially in the field of radiation medicine, where medical physicists are and should be strongly involved. The work of medical physicists in hospitals goes far beyond routine clinical and research tasks and reach demanding fields from radiation protection of patients, personnel and general public to the selection of expensive and complex equipment used in radiation medicine. Recalling the roles and responsibilities of MPE as defined and requested in the EU BSS Directive[14], it is clear that all mentioned

tasks cannot possibly be fulfilled, if MPE is not officially involved in the policy and decision making processes in the hospitals.

Legislative and regulative requirements

Throughout this paper the two most important recently published documents were quoted several times: EU BSS Directive[14] and IAEA IBSS.[16] In the foreword of the second document, the IAEA Director General Yukiya Amano among other said: *"Standards are only effective if they are properly applied in practice."* And continued: "*Regulating safety is a national responsibility, and many States have decided to adopt the IAEA's standards for use in their national regulations. For parties to the various international safety conventions, IAEA standards provide a consistent, reliable means of ensuring the effective fulfilment of obligations under the conventions. The standards are also applied by regulatory bodies and operators around the world to enhance safety in nuclear power generation and in nuclear applications in medicine, industry, agriculture and research."*

Any standard, if it is not implemented into national legislations and regulations, followed by a committed introduction into the clinical work, have a limited value. IAEA IBSS are important and extremely well prepared official recommendations from distinguished authority; however, adoption of these standards is, as said by Director General, a national responsibility. It is even binding for those IAEA Member States who are involved in Technical Cooperation (TC) activities with the IAEA.

EU BSS Directive[14] on the other hand is legally binding. In Article 106 the obligations for European Union member states are clearly stated: ***"Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 6 February 2018."***

The two above mentioned documents require from national authorities to transpose written standards and recommendations into local legislation. Concerning IAEA IBSS[16] national authorities have at least moral obligation to follow and implement recommended safety standards in order to optimize medical diagnosis and treatment of human diseases and to improve human health and well-being. Regarding the EU BSS Directive[14], there is a clear and firm legal obligation and responsibility for all European Union countries to adopt national legislation in order to comply with the requirements of the directive.

Conclusions

Work and devotion of medical physicists was nicely described by the esteemed medical physicist Prof. Ervin B. Podgorsak in his speech after acceptance of Coolidge award in 2006:

"A healthy man has a thousand wishes, a sick man has only one. Most of the work of medical physicists is indirectly related to people who have only one wish. We must not forget that, despite our scientific and technical training, our strongest guiding attributes must be compassion for patients and discipline toward our work."

Call for action is addressed to the national authorities, ministries of health and hospitals, to implement the latest international recommendations discussed in this paper without hesitation, completely, with great care and empathy in close cooperation with professional bodies, societies and organizations; it is their moral and legal responsibility. National authorities shall follow this road, above all for the benefit of millions of patients throughout the Europe and all over the world, otherwise "*compassion for patients and discipline toward our work*" might soon become an insufficient driving force.

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