International Organization for Medical Physics

Electronic Medical Physics World

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“Cancer and Biomedical Physics”

The President´s View

From the early beginning, when our profession’s domain was just radiation measurement, dose computation and development of radiological instrumentation, Medical Physics was continuously expanding into all fields of medicine and cross linking with other sciences, especially with biomedical engineering and biomedical computing, resulting in the today’s comprehensive armaments in health care.

About 8 million people died from cancer in the world during 2007. In the light of the recent cancer campaigns launched by several organizations, including UICC, IAEA and WHO, I feel challenged from the IOMP side to join in these initiatives by considering briefly the role of our profession in the fight against cancer.

Looking back at the time when I moved from my former Nuclear Physics world, investigating few-nucleon interaction phenomena, to a radiotherapy hospital as medical physicist doing dosimetry, treatment planning (manually computed hand-colored isodose plans for up to three patients a day) and QA of a single cobalt unit, throughout the next few decades I witnessed the implementation of fantastic inventions and paramount improvements aiming at a more efficient and less toxic cancer treatment. What a progress - ranging from the early cobalt era via giant leaps in dose computation, novel imaging technologies and ultimate equipment for treatment delivery, up to the futuristic tools of a laser generated carbon beam. A long chain of marvelous pearls coined with magic names as 3D-CRT, MLC, IBT, pRT, PET, MRI, IMAT, IGRT, IMRT, bART, LGK, MC, etc. mark the creativity of medical physicists and their genuine capability to cross over bridges to various disciplines and cooperate closely with other scientists in medicine, physics, engineering, informatics and computer science, biology and biochemistry. An impressive scenario; however two slightly diabolically phrased questions may be raised. If there is to be progress in cancer treatment, is it due to achievements of medical physics? and, second, if there is a future for medical physics, what are the future perspectives?

In industrial countries about 50% of all cancer patients are cured, half of them by surgery, the remainder by radiotherapy, either alone or combined with surgery or chemotherapy or both. A small minority of cancers such as lymphomas are cured by drugs alone (5%). In about 90% of all palliative treatments radiotherapy is involved. Wherever radiotherapy is applied in cancer treatment (more than 2/3), patients benefit from early cancer detection using innovative imaging methods, accurate dosimetry, individually optimized image based treatment planning, high precision treatment delivery techniques, methods of dose reduction outside the target volume, and not least all QA, safety and radiation protection measures. Sounds reasonable, but is it really more than good lobbying for Medical Physics, in particular when noticing the public perception of anticancer drug therapy as the far most important cancer treatment modality? As a matter of fact, it is the clinical evidence demonstrating the superiority of a given treatment, and in this respect advanced radiation therapy technologies are superior. Despite the enormous efforts in pharmaceutical research there is yet no data for a successful treatment of solid tumors (ca. 85% of all cancers) by drug delivery alone. On the contrary, there are data from clinical trials (e.g. breast, uterus, prostate, lung, intestine, head & neck, sarcomas, skin) demonstrating enhanced survival rates, less toxicity and better quality of life when applying conformal irradiation techniques (e.g. IMRT) in comparison to conventional methods, let alone the much higher cost-effectiveness of any radiation treatment. A new fascinating field of research is rapidly growing - ion beam therapy - which is still in

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its infancy, and even more remote when based on laser generated particle sources. The laser sources are expected to mature to a less monstrous and more cost-effective design of a radiation treatment unit.

A similar impressive story, similar to the medical physics driven radiotherapy one, is the development of imaging technology such as CT, MRI and PET aiming at an ever earlier detection and hence more effective treatment of cancer. There are data demonstrating the shift from late to early cancers due to improved diagnostic methods, e.g. the 5-year survival rate of breast carcinoma patients has increased by 10% over a 10 year period. However, despite the huge progress in imaging technology, today one can still hardly detect a soft tissue tumor less than about 5 mm in diameter. However, new tools in early cancer detection, novel imaging methods, special sensors, lab-on-the-chip technologies etc. are required to have a chance of tumor eradication prior to metastasizing and hence to improve cancer cure rates significantly. Promising new frontiers in diagnostic instrumentation are phase contrast imaging with spatial resolution down to several hundred nanometers, or even less, when applying coherent light sources like lasers. Other horizons are high field MRI, highly sensitive optical imaging, e.g. Raman spectroscopic imaging with the option to simultaneously detect manifold biomarkers in-vivo, novel ultra high resolution microscopy methods, not to forget the various concepts of hybrid imagers.

So, my personal answer to the above two questions is simple: it is evident that medical physics has contributed enormously in combating cancer and is still facing new challenges to initiate further progress both in diagnostics, by creating more sensitive and high resolution detection methods, as well as in therapy by more extensively integrating imaging and treatment instrumentation and providing novel cost-effective radiation sources. Accordingly, the medical physicist from the cobalt era will benefit from a much wider horizon: he will be forced to interact significantly more with other professions from the life sciences; in particular he will more deeply dive into biology and biochemistry to cope with the trend of closer entanglement of multi modality imaging and treatment instrumentation. Medical Physics will open up to Biomedical Physics (note this term is yet more and more used for designating current research and education programs as well as in university institutes worldwide).

Finally, what is the role of IOMP to foster this maturation process of our profession? Three aspects emphasized in the IOMP mission statement seem to me most important:

(1) Advancing Medical Physics in science, i.e. to support any actions in promoting Medical Physics as a branch of Applied Physics. The IOMP Science Committee will develop appropriate initiatives. Furthermore, through the membership of our International Commission of Medical Physics (IComMP), IOMP is linked to the International Union of Pure and Applied Physics (IUPAP) and the International Union of Pure and Applied Biophysics (IUPAB) which provides an attractive platform for a scientific dialogue.

(2) Fostering the educational and professional development of medical physicists: the fast growing of new methods and equipment requires appropriate education and training. IOMP through its Education & Training Committee, as well as through its Professional Committee, aims to establish proper measures for harmonizing the great world wide imbalances in the availability of properly trained Medical Physicists to provide highest quality service for all patients.

(3) Disseminating Medical Physics knowledge and expertise, particularly in the developing countries: to identify the needs and to take forward adequate actions in disseminating Medical Physics progress throughout the world.

As declared when coming into office in 2009, IOMP is particularly focusing at Africa and Latin America, and we will strengthen the already started initiatives there to establish appropriate structures for Medical Physics development. Accordingly, key action of IOMP during the forthcoming term will be closer cooperation with the WHO and the IAEA.

In conclusion, with confidence in the future of Medical Physics, or after what has been said before, Biomedical Physics, and with great enthusiasm, jointly with the entire IOMP team I am pleased to embark on my journey as your president. Please share your views and ideas with me during the forthcoming term and provide me with your support on the way forward so can together advance our profession.

Fridtjof Nüsslin, Munich June 2010

Deadlines for Future Issues

November 10, 2010

April 10, 2011

Please send material to:

Freyd@musc.edu

Welcome to the Electronic Medical Physics World

Welcome to the new "Electronic Medical Physics World." eMPW is an exciting new activity of the IOMP. We are building on the many years of effort of Ishmael Parasi, who was the previous editor. Without Ishmael we would not have eMPW. Truly I am "standing on the shoulders of a giant." I also have to thank Bill Hendee and all of the Publications Committee for having the vision for a new and improved eMPW.

Focus on Education

The eMPW is going to focus on medical physics education. Medical physicists have to educate many people about medical physics

- Medical Physicists
- Physicians
- Ancillary Personnel
- Government Regulators
- Members of the Public

We have to do this with limitations on our time and resources. eMPW hopes to serve as a way to communicate about our success and failures. It will touch the wide spectrum of education around the world and especially innovations of importance. I invite each and every one of you to send me brief articles about education and announcements about conferences about education.

- How do you educate individuals in your country?
- What innovations have you come up with?
- What changes have been made in the educational requirements?

We are interested in everyone's perspective. This issue of eMPW has a report from Chip Jackson, a medical physics student, in Australia. We would welcome brief reports from medical physics students through out the world

G. Donald Frey

Editor – eMPW

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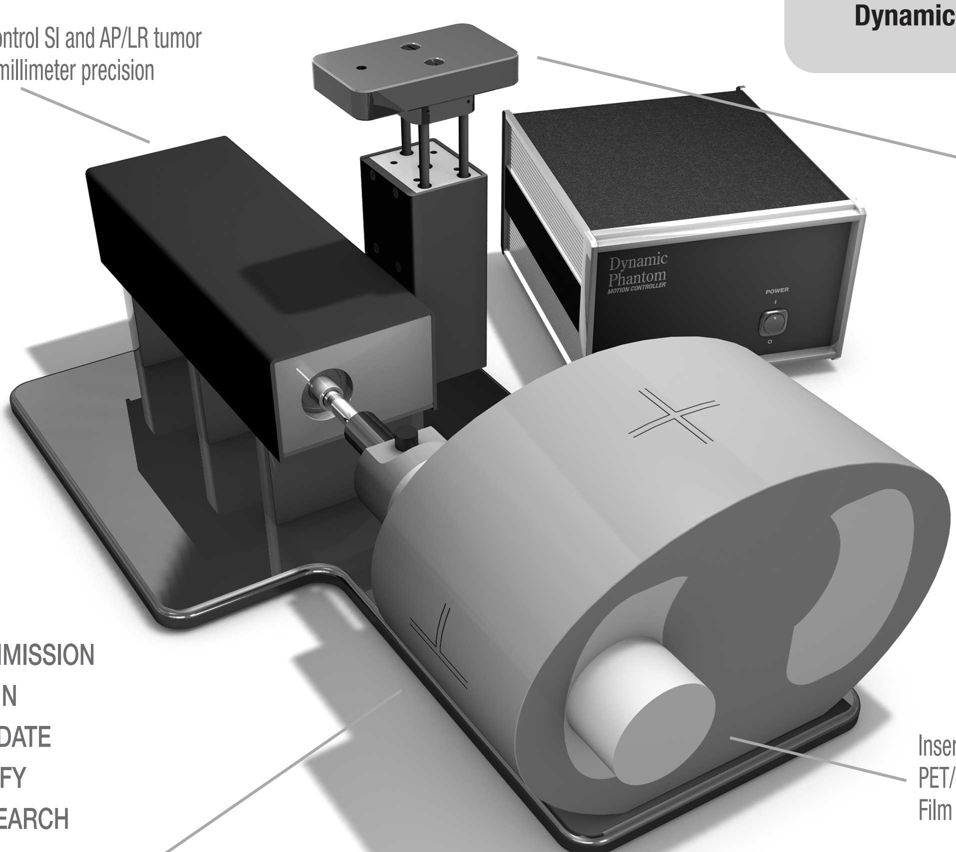

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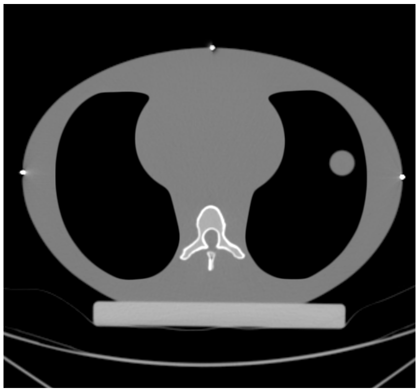

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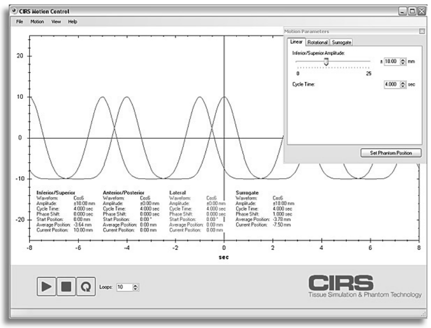

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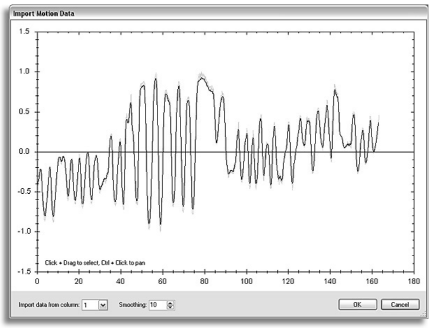

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A Student in Medical Physics in Australia

In an en ever-changing field, the educational process for contemporary students of medical physics may be remarkably different from their more-experienced peers. This has been my experience as a student. Technology has changed the face of learning. Furthermore it has changed the equipment and how we interact with it. In spite of technological evolutions, it seems that the principle skills, whether they be the scientific theories or process of undertaking research, often remain the same.

A firm understanding of the relevant physical concepts is vital for a student. Learning from text books is as necessary in this area as in any other. In order to work in a field, it is necessary to know all of its ins and outs. That means knowing the tasks related to the job, or as a researcher it is important to understand the current knowledge-base: what is known and also what's not known. It can be frustrating to spend weeks designing a solution to some hurdle in research only to find that someone else has solved it quite elegantly before. Although those little challenges tend to expand creativity and problem-solving skills, the feeling that you have tried to “reinvent the wheel” when an answer was out there all along is both inefficient and disheartening. Having a good background of the current literature is often helpful in this case. Peer-reviewed literature will also give insight into the gaps in the knowledge-base; the areas that haven’t yet been explored and would be helpful to the scientific community. Text books provide a solid foundation of understanding, but keeping current with published literature has been, in my experience, more valuable.

Being a student of the information technology generation, finding the relevant articles comes with minimal effort. The days of going to a library stack and leafing through volume after volume of old journals are gone. One can almost become an expert in a particular sub-field with a dedicated afternoon of research. Between looking up an article on Science Direct and tracking down its references (now commonly linked on the web), you can find everything relevant that came before it. You can also find what came after it using a tool such as Google Scholar's “cited by” feature. Both of these will give an in-depth understanding of a research area. By piecing together these articles, it is even possible to construct a narrative of how the knowledge-base has advanced over time. And so before it might have been an issue of finding the information at all, now it's almost an issue of finding too much information that deserves attention.

Journals will always be a mainstay for finding the cutting-edge research, but I’ve found that there is no replacement for attending and presenting at conferences. As a student conferences carry special weight because they are where you have the opportunity to validate the work that you might be doing as a researcher. This is where you confirm that your concepts are actually important to a larger audience (something that may seem murky with such limited experience). Frightening though it may be, it is also a good opportunity to discover any short-comings a particular project. Many times that may require an outsider's point-of-view. Having dealt with the project on an almost daily basis, it may be difficult for students, supervisors, and collaborators to view the work with fresh eyes. I still get nervous at the thought of going and presenting to a room of professional colleagues because I know they have more experience than me. As much as I'm confident in the work, there are some things I just can't know from reading. It takes the input of outsiders to either bolster your efforts or suggest some improvements. It is also valuable to see how other people that are at the top of their field present their work, their research techniques, and how they tend to focus their efforts.

From my experience it seems that advances in technology have changed the skill-set of the medical physicist. Equipment may be more sophisticated (as with IMRT) and computers are affecting the way we operate it. The machines we use now are different to the ones we used a decade ago, and the machines we use now are different to the ones we will use in a decade's-time. Some of the concepts even will change. And one thing that may be particularly different with the upcoming generation is that computation has altered the way that we, as physicists, do our work. Comparing recent journal articles with those from two to three decades ago , I notice that older publications are laden with mathematical equations, whereas more recent articles, though they may have an equation or two, tend to contain more images, descriptive analysis, and data tables. Mathematical modelling seems to have been replaced by computational modelling. In my work, calculations that would have involved numerous equations and output an answer that was only partially-representative of real world conditions have been replaced by simplified Monte Carlo simulations that produce more accurate and descriptive data. Looking back, the years of calculus in my bachelor's degree could have been appropriately replaced with a semester or two of computer science.

All of that aside, I have found that learning from the experiments associated with my research work was the most significant. The challenge of overcoming some obstacle in a project generally led to some small innovation. Often, it required me to learn a new technique and tested my creativity to find an efficient and practical solution. In that way, it generally felt more rewarding than typical course-learning and, at the end, the results represented my work in a more personal way. There is a greater sense of pride and it may also more applicable to the skills that will be needed in the workplace.

Finally, being a student is still being a student and there will always be some mistakes along the way. Not everything has gone perfectly to plan, but at the end I am prepared to be a professional (where hopefully more goes to plan). Now I have the skills to transition from a research project designed by a supervisor make it my own by finding new avenues to expand the information in the scientific community. It has given the skills to make collaborations, organize my work, and adapt to any setbacks that might occur along the way.

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Comparative Analysis of ^{60}Co Intensity-Modulated Radiation Therapy

Fox C, Romeijn HE, Lynch B, Men C, Aleman DM and Dempsey JF

Phys Med Biol. 2008 Jun 21;53(12):3175-88

In this study, we perform a scientific comparative analysis of using (60)Co beams in intensity modulated radiation therapy (IMRT). In particular, we evaluate the treatment plan quality obtained with (i) 6 MV, 18 MV and (60)Co IMRT; (ii) different numbers of static multileaf collimator (MLC) delivered (60)Co beams and (iii) a helical tomotherapy (60)Co beam geometry. We employ a convex fluence map optimization (FMO) model, which allows for the comparison of plan quality between different beam energies and configurations for a given case. A total of 25 clinical patient cases that each contain volumetric CT studies, primary and secondary delineated targets, and contoured structures were studied: 5 head-and-neck (H&N), 5 prostate, 5 central nervous system (CNS), 5 breast and 5 lung cases. The DICOM plan data were anonymized and exported to the University of Florida optimized radiation therapy (UFORT) treatment planning system. The FMO problem was solved for each case for 5-71 equidistant beams as well as a helical geometry for H&N, prostate, CNS and lung cases, and for 3-7 equidistant beams in the upper hemisphere for breast cases, all with 6 MV, 18 MV and (60)Co dose models. In all cases, 95% of the target volumes received at least the prescribed dose with clinical sparing criteria for critical organs being met for all structures that were not wholly or partially contained within the target volume. Improvements in critical organ sparing were found with an increasing number of equidistant (60)Co beams, yet were marginal above 9 beams for H&N, prostate, CNS and lung. Breast cases produced similar plans for 3-7 beams. A helical (60)Co beam geometry achieved similar plan quality as static plans with 11 equidistant (60)Co beams. Furthermore, 18 MV plans were initially found not to provide the same target coverage as 6 MV and (60)Co plans; however, adjusting the trade-offs in the optimization model allowed equivalent target coverage for 18 MV. For plans with comparable target coverage, critical structure sparing was best achieved with 6 MV beams followed closely by (60)Co beams, with 18 MV beams requiring significantly increased dose to critical structures. In this paper, we report in detail on a representative set of results from these experiments. The results of the investigation demonstrate the potential for IMRT radiotherapy employing commercially available (60)Co sources and a double-focused MLC. Increasing the number of equidistant beams beyond 9 was not observed to significantly improve target coverage or critical organ sparing and static plans were found to produce comparable plans to those obtained using a helical tomotherapy treatment delivery when optimized using the same well-tuned convex FMO model. While previous studies have shown that 18 MV plans are equivalent to 6 MV for prostate IMRT, we found that the 18 MV beams actually required more fluence to provide similar quality target coverage.

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The Status of Medical Physics in the Middle East Federation of Medical Physicists (MEFOMP) Associated Countries

Medical physics associations comprising MEFOMP are from different regional countries including Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yeman. There is a vast heterogeneity of medical physics practice among these countries. The followings are summary information about the medical physics situation in each MEFOMP member country.

Bahrain: Bahrain Society of Medical Physics and Bio-engineering has been established in February 2008, and has about 40 members. At academic level, University of Bahrain run a BSc course in Medical Physics, and held workshop for Physicians and Radiographers working in local Hospitals. There is no accreditation systems, no local professional certification system and no, Professional Registration system in this country.

Iran: Iranian Association of Medical Physicists (IAMP) is established about 15 years ago and at present is one of the most active non-governmental scientific associations in this country. The president and committee in charge of IAMP are elected every 3 years by the members under auspices of the Ministry of Health and Medical Education of Iran. This committee has 7 members including the president. The association has 270 registered members working in different disciplines of Medical Physics, including 130 PhD holders (nearly all of them are university faculty members and professors) and 140 MS holders who are either PhD students at present or working in hospitals. This association runs a congress every two years about scientific achievements of researchers in Iran. At present 5 universities run Ph.D course and 9 universities run MSc course involved in educating in the field of Medical physics. The Iranian journal of Medical physics is published by the IAMP quarterly in Persian language and, the Iranian Journal of Radiation Research published internationally in English language also covers the medical physics subjects. MP programs in the universities are provided by the board of medical physicists in the Ministry of Health and Higher Education and are run universally in all universities throughout Iran. There is no professional certification System at the present time, but IAMP is going to set up a certification program for Radiation Oncology physicists. Registration is provided by Ministry of Health and Education after passing academic courses in medical physics.

Iraq: The medical physics association in Iraq is not yet established; therefore the information about the status of MP in this country is limited to those working at universities as professor and teachers. University of Baghdad provides BS & University of Mustansiriya provides MS and PhD (on hold now). There is no consistent program for accreditation systems, no local professional certification system and no, Professional Registration system in this country.

Jordan: The Jordanian Association for Physicists in Medicine, JAPM, was founded in 2006. JAPM consists of 50 members (2 honorary, 43 full active, & 5 student members). JAPM members work in the medical, the governmental and the academic fields. Yarmouk University offers an undergraduate degree in Biomedical Physics & Jordan University offers a master degree in Medical Physics. There is no accreditation systems, no local professional certification system but there is a Professional Registration system in this country through licensing from the JAEC for "radiation safety".

Kuwait: There is no medical physics society established in Kuwait yet, and there are around 15 medical physicists working in this country.

Lebanon: The Lebanese Association of Medical Physics was established in 2007. There are only 7 medical physics working in Lebanon. Lebanese University opened on 2007 an MSc degree in Quality Control Physicist. There is no accreditation systems, no local professional certification system and no Professional Registration system in this country.

Oman: There is no Medical physics society established in Oman yet. There are 6 PhD level qualified Medical Physicists, 4 BS level medical physicists, and 1 Dosimetrist working in this country.

Qatar: There is no local society for medical physicists established yet but there are a number of physicists working at 5 hospitals in this country.

Saudi Arabia: Saudi Medical Physics Society (SAMPS) has about 100 members working at universities or hospitals. Umal Quara University runs a BSc and King Fahad University run MSc course. There is no accreditation systems, no local professional certification system in this country. Professional Registration system is done by the Saudi Commission for health specialties.

Syria: Syrian Association of Medical Physicists is not established yet. There are around 30 Medical physicists working in this country with various academic degrees. A post-graduate diploma in Radiation Safety is offered in Syria. There are no accreditation systems, no local professional certification system and no Professional Registration system in this country.

United Arab Emirates: Emirates Medical Physics Society (EMPS) is established in 2005. EMPS has around 40 Members. This society has conducted training workshops and organized 16th International Conference on Medical Physics in 2008. Undergraduate degree in Medical Physics is offered in UAE. There are no accreditation systems, no local professional certification system and no Professional Registration system in this country.

No information I could get for the medical physics activities in Yeman.

The above information clearly indicates that existence of a universal educational and research programs and also accreditation and professional certification system is a necessity for promotion of medical physics in this region.

Hossein Mozdarani, Ph.D,

Prof. Radiation Biology

Representative of MEFOMP in IOMP Scientific Committee

New Eligibility Requirements for the American Board of Radiology (ABR) Certification in Radiologic Physics – An Overview of the Changes and the Rationale

Stephen R. Thomas, Ph.D., Associate Executive Director, Radiologic Physics, The American Board of Radiology.

The American Board of Radiology (ABR) [http://theabr.org/] is one of 24 medical boards under the American Board of Medical Specialties (ABMS) [http://abms.org/] providing certification in various medical disciplines. The ABR certifies physicians in Diagnostic Radiology and Radiation Oncology and medical physicists in one of three areas; namely, Therapeutic Radiologic Physics, Diagnostic Radiologic Physics, and Medical Nuclear Physics. In brief, the examination sequence for radiologic physicists consists of 3 parts: Part 1 - computer based exam ("written") on general medical physics and clinical concepts; Part 2 - computer based comprehensive exam ("written") in the specific radiologic physics area chosen; Part 3 – oral exam in the specific area chosen. Eligibility requirements for each exam are specified on the ABR website. Parts 1 and 2 must be passed sequentially before the candidate is allowed to take the oral exam. Upon passing the oral exam, the candidate is certified as a diplomate of the ABR in the given area.

In 2002, the ABR announced a policy whereby a prerequisite for certification in radiologic physics after 2012 would be completion of an educational program in medical physics accredited by the Commission on Accreditation of Medical Physics Education Programs (CAMPEP) [http://campep.org/]. A principal factor leading to the 2002 policy statement was concern among the ABR Radiologic Physics Trustees and exam committee chairs regarding the level of knowledge of candidates applying for certification who came from non-structured medical physics graduate programs. Another point coming to the forefront more recently was the fact that the ABR certification process for radiologic physics is one of only two within the 24 boards of the ABMS that does not require a formal residency prior to certification.

In August 2007, in recognition of the fact that only 5 years remained before the 2012 deadline, the ABR convened a Summit meeting for the purpose of obtaining the perspective and opinions of associated organizations and stakeholders concerning options for transition from the current eligibility requirements. The Summit was attended by leaders from the American Association of Physicists in Medicine (AAPM), CAMPEP, the American College of Radiology (ACR), the American

College of Medical Physicists (ACMP), the Canadian College of Physicists in Medicine (CCPM), the ABR, and directors of CAMPEP accredited programs (both medical physics graduate programs and residencies).

The Summit discussions touched on many issues associated with the ABR policy transition in 2012. The original policy statement as enunciated by the ABR specified that as of 2012 and thereafter certification in radiologic physics would require that the candidate had successfully completed a CAMPEP accredited educational program that could have included either a graduate degree (MS or PhD) or a medical physics residency. Among those present at the Summit, a general consensus evolved that the new policy should state that an accredited medical physics residency (clinical, 2 years) was required. This reflected the AAPM Board of Directors resolution passed in March 2007 and reconfirmed in July 2007 that completion of a CAMPEP accredited residency should be required. There was unanimous agreement that the quality of clinical training leading to eligibility for the ABR certification examinations would be elevated by requiring a CAMPEP accredited residency. A repeated theme was that patient care is paramount in the practice of medical physics and that properly trained medical physicists are essential to ensuring that high quality medical care is provided. Residency programs were considered of critical importance in providing the clinical experience necessary for preparing the candidate for board certification as well as for a successful career in medical physics.

Upon deliberation following the 2007 Summit, the Radiologic Physics Trustees recommended a 2-step initiative that was approved by the full ABR Board of Trustees and became policy. As currently stated on the ABR website [http://theabr.org/ic/ic_rp/ic_rp_newcampep.html]:

2012 Initiative:
Candidates taking the American Board of Radiology Part 1 examination in radiologic physics <u>for the first time in 2012 or later</u> must be enrolled in or have graduated from a CAMPEP-accredited education program (e.g., MS, PhD, or residency). If a candidate has graduated from the CAMPEP-accredited education program at the time of application, they must be working as a medical physicist as specified on the ABR website.

2014 Initiative:
Candidates taking Part 1 <u>for the first time in 2014 or later also</u> must have completed a CAMPEP-accredited residency program before being eligible to take the Part 2 examination in Radiologic Physics.

It is noted that the new eligibility requirements for Part 1 and Part 2 will not be applied retroactively to candidates in process. If a candidate's completed application for Part 1 is submitted for an examination to take place prior to the dates specified in the new requirements above, the candidate is subject only to the rules in effect at the time of submission and is not bound by any subsequent new rules.

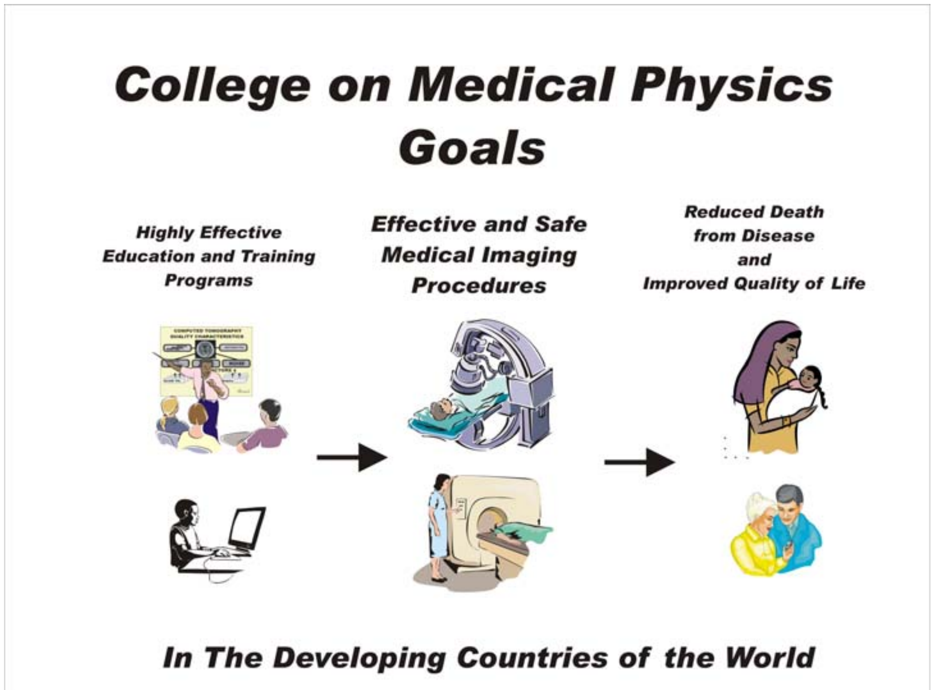
A number of obvious issues and points for follow-up were clearly recognized by the medical physics community. The challenges included the imperative for CAMPEP to establish the operational capacity to review the increase in applications expected in response to the 2012/2014 timelines. Confidence was expressed that CAMPEP could develop the capability to serve as the accrediting body for medical physics educational programs and accommodate any increase in demand that may arise leading up to Initiative timelines. The need for a dramatic increase in medical physics residencies was clearly understood. A major issue in this regard centered on economics and the requirement that sufficient funding be available to support these residencies.

To address these challenges and review functional progress, subsequent annual summits have been hosted by the AAPM in the Jan/Feb time frame with meetings held in 2008, 2009, and 2010. The AAPM has expressed a commitment to working toward the goal of ensuring that adequate residency opportunities are available by the 2014 target date. Discussions at these Summits have focused on medical physics manpower needs, the number of medical physics graduates being produced, and projections as to the number of residency positions required. Support for CAMPEP to ensure an effective accrediting organization was considered critical. On a positive note, the number of medical physics residencies is continuing to increase with cautious optimism that sufficient residency slots will be available by 2014. Innovative models are being investigated whereby a “hub and spoke” structure is implemented between an academic center (“hub”) and satellite private institutions housing a resident (“spoke”).

Thus the ABR looks forward to the transitions signaled by the 2012 and 2014 initiatives. Standardization in training culminating in completion of a 2-year accredited clinical medical physics residency will raise the qualifications of candidates applying for ABR certification in radiologic physics leading to improved health care for patients in those areas of medicine touched by the practice of medical physics.

The ICTP College on Medical Physics

Meeting Educational Needs in the Developing Countries



The value of any educational program is determined by its success in meeting the specific needs of those who participate in its learning activities. The biannual College on Medical Physics at the Abdus Salam International Centre for Theoretical Physics (ICTP is perhaps unique in its focus and impact in improving the practice of clinical medical physics, medical diagnosis, and healthcare on a global basis. This occurs through several steps as illustrated below.

The ultimate goal is to reduce deaths from diseases, such as cancer, and improve the quality of life through more effective and safe applications of the many medical imaging methods that are available.

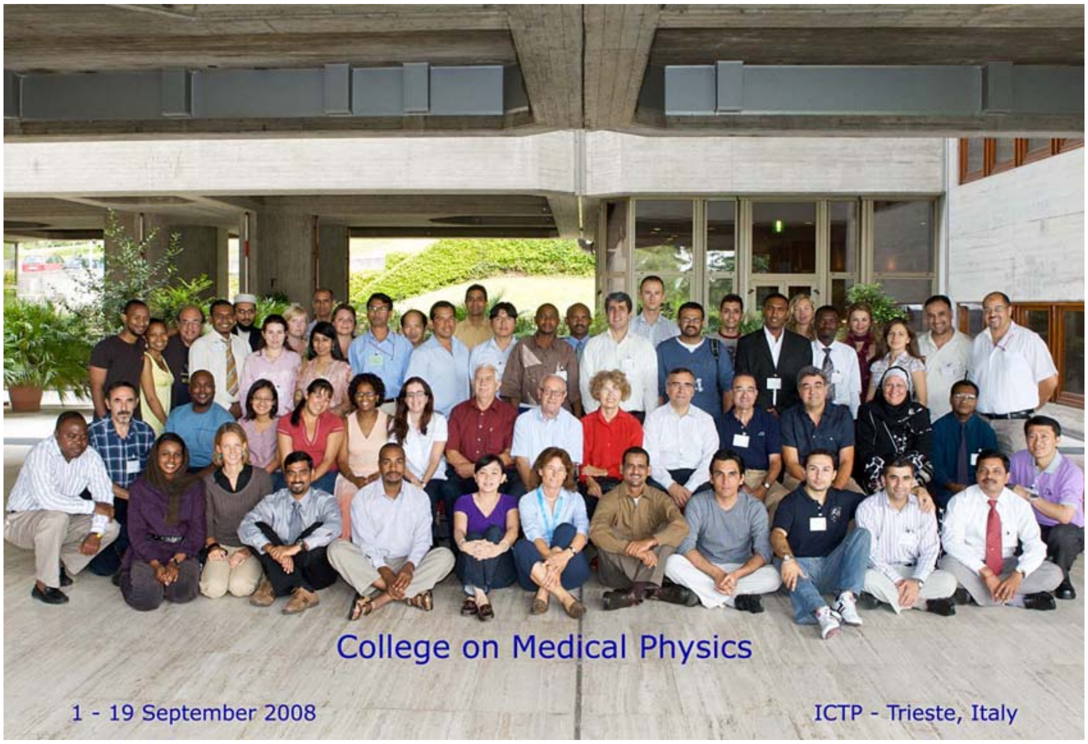
The development and availability of medical imaging technology such as computed tomography (CT), magnetic resonance imaging (MRI), radionuclide imaging, advanced radiographic and fluoroscopic methods have dramatically increased the effectiveness of diagnostic procedures for many diseases. One of the most valuable is the increased sensitivity for detecting cancers at an early stage when they are most treatable and lives can be saved. However, the newer and more complex imaging technology and methods require a staff of trained professionals with up to date knowledge on the optimization of the imaging procedures to produce the required image quality and the management of any radiation risk associated with the procedures. The clinical medical physicist is the professional who provides this critical training and consulting service on a local basis along with other quality assurance and safety functions. This in turn, requires that the clinical medical physicists in each country have access to learning opportunities covering the design and function of currently available imaging equipment along with procedures to optimize image quality and address related safety issues.

The ICTP College on Medical Physics has been the highly effective provider of education and training to address this need for many years. In a typical biannual course on the ICTP campus in Trieste, Italy, participants from approximately 40 of the Developing Countries will develop the knowledge and resources to take back to their home countries.

Many of the participants are medical physics educators in their countries so what they learn and the materials and resources they receive will benefit many throughout their regions of the world. During the College program there are sessions on developing and conducting effective educational programs and activities, with an emphasis on using state-of-the-art educational resources and methods.

The directors and faculty of the College are practicing clinical medical physics and educators with extensive experience in the effective and safe applications of medical imaging technology. Their role is to take the knowledge that is developed in some of the major clinical centers of the world and make it available to the medical imaging facilities in the developing countries.

The first College on Medical Physics, in its current format, was offered in 1988 with 68 scientists from developing countries participating. The ten Colleges since then have provided unique learning opportunities for approximately 650 medical physicists and related professionals from the developing countries. It has been observed that the majority of the clinical medical physics education programs in the developing countries around the world have directors and faculty members who have participated in the ICTP College on Medical Physics. Their College experience and the resources they receive provide a strong foundation for their individual programs. The participants in the 2008 College are shown below.



For the 2010 program the ICTP has received 256 applications from medical physicists in 48 countries. There is no tuition charge for qualified participants but funding to cover the cost of travel and living will be limited to approximately 60 participants.

It is expected that the 2010 program with the added emphasis on the evolution of digital technology in the field of medical imaging will be another significant step in enhancing the role of the medical physicists to increase the effectiveness and the safety applications of the many methods of medical imaging technology.

Information on the College on Medical Physics and other programs of the ICTP are available on the web site: http://www.ictp.it/

About the author:

Perry Sprawls, Ph.D., is currently Distinguished Emeritus Professor at Emory University, Atlanta and supports medical imaging physics education, especially in the developing countries, thought the Sprawls Educational Foundation, http://www.sprawls.org

Prof. Sprawls has served the College on Medical Physics as a member of the faculty or director since 1996.