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Professional and Legal Responsibility of a Medical Physicist

Oskar A. Chomicki, President of IOMP

I think I owe you a few words of explanation. So far the President has been expected to write a report on the activities of IOMP to be published in each issue of the *Medical Physics World*. I would like, however, to propose that instead I would try to raise some general, both theoretical and practical, problems pertaining to medical physics that we might think over and discuss together. I would be more than happy if you could send me your comments, criticisms and suggestions.

It has become almost a cliche that Medical Physics and/or Biomedical (or Hospital) Engineering represent the application of principles and equipment of physics and engineering with the specific aim of improving human health and well-being. However, medical physics cannot always be distinguished from **biomedical engineering**. In countries where science and technology, and in particular physics, are taught differently at universities and technical colleges, the division could be based on the name of the degree obtained upon graduation. In other countries, the division may be based on the existence of societies or associations whose names may include the term 'engineering' or' physics'. In what follows we shall be concerned with the medical physicist's role and responsibilities, bearing in mind that similar considerations may be applied to biomedical engineers.

Physicians working in radiotherapy, X-ray diagnosis or nuclear medicine, when it comes to choosing proper instrumentation, are largely dependent on the knowledge and experience of medical physicists who work with them. This is especially true in developing countries, where most medical centres are insufficiently equipped, and due to inadequate financial resources cannot risk wasting their money on purchasing expensive state-of-the-art apparatus advertised by manufacturers. There exists a conflict of interest between manufacturers and users in designing a process or device to be applied in health-care, in selecting and evaluating those processes and devices, or in allocating funds for their development and reaping the financial benefits. Since most of the new techniques are costly (e.g. the artificial heart, NMR machines) there is a moral obligation to design and/or purchase equipment that is affordable. Selecting equipment should be based on the **cost/benefit ratio** (economic considerations), as well as on the **risk/benefit analysis** (i.e. health risks to individual patients and society). The conflict between **individual care** and **society's needs** is the domain of a physician, however medical physicists and/or biomedical engineers are becoming increasingly involved in it.

As Dr. O'Leary of Duke University (USA) put it:" The technological advances of the [future] will dwarf those of the past [...], thereby widening the capacity-payment gulf".

Physicists who are (or should be) responsible for purchases of equipment should have all the available information to help them in making proper decisions. First of all, they should be aware of the current needs and plans of the medical departments where they are employed. In this respect, a medical physicist finds it sometimes quite difficult to go along with physicians whose ambition is to follow examples of other domestic or foreign centre rather than adjust their own needs to their financial possibilities. In such situations, it is the professional responsibility of the medical physicist to try to persuade the overambitious physician to come to an agreement or a compromise concerning the proper choice of equipment. That is why it is most important for medical physicists to develop friendly relations with the medical world so as to achieve a status of partnership else they will be relegated to the role of minor co-workers or even technicians on whose authority the physicians do not have to rely. Much depends on the personality and competence of a medical physicist. Achieving a position of authority among medical men may not be easy, but in the end, it will be of beneficial for both parties.

Another problem arises with the complexity and sophistication of modern therapy machines which require close cooperation with qualified electronics engineers. It is very seldom that a medical physicist can be held responsible for any breakdowns in the operation of costly and complicated machines. Again good cooperation as well as division of tasks and responsibilities between them guarantee smooth functioning of the department.

Apart from the question of cost/benefit etc., the main considerations to be taken into account in the choice of equipment are: (1) its relative prevalence in medical establishments, and (2) assurance of easily accessible servicing by an authorized dealer.

When the newly purchased equipment has been installed, which is usually the responsibility of the dealer, the physicist should spend some time using the instruments and checking them to detect all their good and bad points, especially in view of their future use by technicians. It is, therefore, important that an instruction manual or a set of simple but clear and exact instructions be developed to become the basis for training, which could be used by the other technical personnel, such as nurses or technicians. Testing of equipment and checking of product liability, lead to new standards in quality-control and technology assessment.

Most equipment used in medical establishments has achieved a high degree of sophistication, and its faultless operation is decisive in making good medical diagnosis and/or providing effective therapy. In this respect, quality control or, in other words, regular "checks" are absolutely necessary and constitute a major part of the physicist's professional responsibility. All failures in providing uninterrupted care may not only be a cause of concern for doctors and patients, but may also involve problems of legal responsibility. There is no excuse for any negligence or carelessness, especially when radioisotope or radiation therapy is employed.

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The physicist's task and responsibility lies, among other things, in proper preparation and interpretation of various procedures which, if incorrectly carried out or misinterpreted, may result in serious diagnostic and therapeutic errors. For example, the knowledge of possible artifacts, based on the physicist's thorough familiarity with experimental pitfalls, usually either unknown or unrecognized by physicians, will be most helpful in arriving at the final diagnosis and adequate therapy.

In medical research, the individual responsibility of a physician has become more and more the collective responsibility of a health-care team of paramedical specialists (biologists, chemists, physicists, engineers, etc). Also in medical *care*, the effects of diagnosis and treatment seem largely to depend on the data provided by medical physicists and/or biomedical engineers. In this respect personal responsibility cannot be avoided, although it is not always clearly determined.

Science and technology have created moral dilemmas concerning the application of the results of 'pure' investigations to develop or implement a procedure or equipment that affects individuals or the society as a whole. These dilemmas cannot be alien to medical physicists.

Again the medical experimental design, especially on a large sample of patients and/or data, and the analyses of results require the use of statistical methods. It is the medical physicist who by dint of his thorough mathematical education is best prepared to do the necessary statistical calculations or exercise supervision over the statistical analysis made by physicians. Progress in medicine, which has increasingly become a branch of science, strongly depends on careful and unbiased statistical investigations, which in turn lead to ethical problems pertinent to science, such as honesty, openness, and responsibility for the published results of research. Physics studies, more than any others, have helped to form a mental disposition in a medical physicist (or any physicist for that matter) to be honest and accurate in obtaining and interpreting the results of their research. This may prove most important and decisive when cooperating with the medical professionals. The scope of research done by a medical physicist depends largely on the size and the responsibilities imposed on the physics laboratory. This will vary from one medical institution to another.

Depending on the availability of funds, medical physicists' own research is usually focused on the improvement and/or modernization of the existing instrumentation, and design and construction of new equipment. In this respect, a medical physicist has to cooperate very closely with medical or electronic engineers and physicians who should clearly define their clinical objectives. In general, the medical physicists' education and experience predispose them to carrying out research in conformity with accepted codes of rules and practices.

Finally, when considering legal responsibility, a medical physicist is faced in theory with the same problem of malpractice, or professional negligence, regulated by law, as are doctors, dentists, nurses and pharmacists. Medical physicists do not guarantee the outcome of employing the methods of medical physics or engineering, but they must use diligence and skill in applying them in the treatment of a patient. In theory, the medical physicist should be bound by the Oath of Hippocrates, which has largely been superseded by such modern oaths as the Declaration of Geneva, the International Code of Medical Ethics, and the Canons of the American Medical Association. For example, the International Code of Medical Ethics, developed and promulgated by the World Medical Association shortly after World War II, provides in part for the following:

"*A doctor must always maintain the highest standards of professional conduct*...". Other provisions of the Code do not, however, seem to pertain directly to medical physicists. We may say that the requirement of the 'highest standard of professional conduct' becomes especially serious in the case of therapy administered by a medical physicist in the form of radiation using the unsealed/sealed sources of radioisotopes tantamount to surgery, for which the patient's consent must be obtained. Although the radioisotope treatment (e.g. radio-iodine for thyroid disorders or cancer) is always prescribed by a physician and prepared earlier in well-determined doses by the manufacturer, in many instances and in many nuclear medicine departments the administration procedure is the responsibility of a medical physicist (sometimes radiochemist or radiopharmacist). Legally, the solution to this problem varies from country to country. For example, in Poland the full legal responsibility rests with the physician who is insured against any risk involved and requires a liability contract. However, in this respect the position of the medical physicist remains unclear. In some countries Medical physics organizations provide certification to physicists who have fulfilled postgraduate training and practical requirements and are expected to maintain the necessary standards to provide reasonable assurance to patients that these standards will be upheld. In other countries the situation may not even be as unequivocal as that. I would appreciate very much if you could enlighten me on this subject and send me some information on the situation in your respective countries.

In conclusion, professional and legal responsibilities of medical physicists may be expected to grow in direct proportion to the increased scope of physics and engineering methods and techniques to be applied in medicine in future.

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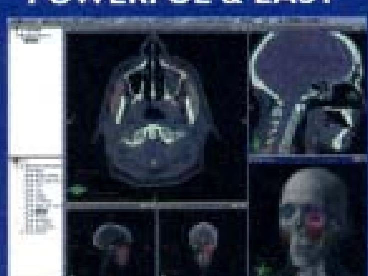

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Role and Responsibilities of Medical Physicists in Radiological Protection of Patients

A Position Paper for Background Session of International Conference on Radiological Protection of Patients in Diagnostic and Interventional Radiology, Nuclear Medicine and Radiotherapy.

Azam Niroomand-Rad, PhD; Vice President, IOMP

About IOMP:

The International Organization for Medical Physics (IOMP) was founded in 1963 as an umbrella organization for national medical physics associations worldwide. Today IOMP has 72 national organizations representing about 16000 medical physicists working in both clinical and research environments. IOMP has several corporate members and 4 international regional organizations:

- **EFOMP** (European Federation of Organizations for Medical Physics with 32 nations),
- **ALFIM** (Latin American Medical Physics Association with 7 nations),
- **SEAFOMP** (South East Asia Federation for Medical Physics with 4 nations), and
- **NAFOMP** (North American Federation for Medical Physics

The objectives of the IOMP are:

(a) To organize international cooperation in medical physics and to promote communication between the various branches of medical physics and allied sciences.

(b) To contribute to the advancement of medical physics in all its aspects.

(c) To advise on the formation of national organizations of medical physics in countries lacking such organizations.

To achieve these goals, over the years IOMP has formed various committees: Education and Training Committee, Science Committee, Publication Committee, Awards and Honors Committee, and Professional Relations Committee. Most recently, IOMP has formed the International Advisory Council with representatives from all regional chapters as well as international organizations with similar interests [e.g., the International Atomic Energy Agency (IAEA), World Health Organization (WHO), Pan American Health Organization (PAHO) and United Nations (UN)].

To promote improvements in medical physics and biomedical engineering, IOMP and IFMBE (International Federation for Medical and Biological Engineering) formed a union called IUPESM (International Union for Physical and Engineering Sciences in Medicine) in 1981. The union became a full member of ICSU (International Council for Science, formerly known as International Council for Scientific Unions) in 1999.

At present the availability of medical physicists and medical physics educational programs is unevenly distributed in the world. To change this we must share resources, ideas, discoveries, and clinical protocols / standards via international conferences. Furthermore, it is costly, both financially and with human resources, to assess new diagnostic and therapeutic devices and to demonstrate the importance of various clinical protocols in management of cancer patients on a local scale. Therefore, we must share our expertise and resources. Finally, the IOMP is dedicated to protecting patients worldwide from unnecessary radiation exposure while providing optimal diagnostic and therapeutic dose in the management of diseases, especially cancer.

General Comments about Radiological Protection of Patients:

The benefits of ionizing radiation in the diagnosis and treatment of cancer, as well as other conditions such as cardiac ablation, are well established. However it is clear from this international meeting and other similar scientific meetings that determination, monitoring, and evaluation of patient doses is not an easy task. Furthermore, radiation doses for individual patients may vary greatly in from one radiological procedure to another.

Attention is needed to reduce unnecessary radiation exposure to patients from ALL types of radiation producing machines and equipment. The patient risk from radiation injury - stochastic and/or deterministic - must be weighted against the benefits of a proper medical examination or treatment as well as the risk of depriving the patient from the necessary medical care. Arbitrary reduction of radiological patient doses without regard to *final outcome* is detrimental to proper medical care provided to the patient. Sacrificing image quality in order to reduce patient dose is potentially harmful to the patient as well. We believe most individuals prefer to bear the risk of radiation if it means finding a life-threatening lesion, instead of missing it.

Furthermore, the role of radiation exposure incurred from screening procedures such as mammography, needs to be properly considered and differentiated from medically indicated procedures. A known radiation induced risk needs to be balanced against diagnostic efficacy of a screening procedure. In these cases, regulations on standards and guidelines for determination, monitoring, and evaluation of patient doses may be appropriate. Trends in mammography quality before and after the implementation of the US Mammography Quality Standards Act (MQSA) of 1992 have recently been evaluated. In this report, the technical data collected in the US have been compared with the corresponding data in Canada. However, even here, it has been recognized that we cannot assume that one dose limit fits all. It is advisable to consider individual patient specifics if it means the difference between detection and miss.

Scientific Guidelines and Professional Standards:

Universal standards and guidelines for determining, monitoring, and evaluating medical exposure of patients have long been the objectives of many scientific and professional organizations, international regulatory bodies, and government agencies. Efforts directed towards attaining these objectives have occupied the time and effort of medical physicists worldwide. The evaluation of this apparent conflict between the two sides of the radiation - benefit and harm - is the joint responsibility of qualified medical physicists and authorized physicians. A *qualified* medical physicist has been defined as an individual who is competent to practice independently and legally authorized to practice in one or more of the subfields in medical physics. Similarly, an *authorized* physician has been defined by a number of professional organizations as a licensed physician with documented training and understanding of physics in one or more of the subfields of radiation physics. Certification / licensing / national registry by a professional organization in the appropriate subfields(s), as well as continuing education in handling radiation-producing equipment is essential. A qualified medical physicist and an authorized physician have the expertise necessary to determine, monitor, and evaluate this tradeoff between the patient dose reduction and patient *final outcome.* They have the expertise to establish protocols for radiation procedures and evaluate radiation outcomes. Moreover, medical physicists are charged with educating hospital staff (such as nurses and radiation technologists) in the proper handling of radiation producing equipment and radioactive materials to avoid harmful practices. Experience shows that substantial (nearly 40%) dose reduction in radiological procedures is possible by training of the physicians and staff.

Standards for the performance of radiation procedures in radiotherapy, nuclear medicine, radiology as well as interventional radiology have been developed by scientific and professional organizations. The objective of these standards, which are reviewed and revised on a periodic basis, is to improve the quality of radiation services to patients using ever-increasing complex technology. These scientific standards are not *rules* to be regulated but a *code of practice* to ensure high-quality radiological care of patients. An existing standard may be modified for an individual patient and available resources. The standards should not be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific procedure or course of conduct is the responsibility of an authorized physician in consultation with qualified medical physicist in light of all the circumstances presented for the individual patient and /or situation.

To protect patients from unnecessary radiation, we need to understand the complexities as well as the limitations in the assumptions that are made in determining, monitoring, and evaluating the patient doses in therapeutic and diagnostic procedures. The role and responsibilities of medical physicists in containment of radiation dose to the patients are described briefly below.

Protection of Patients in Radiation Therapy:

In *radiation therapy,* the first responsibility of a medical physicist and a radiation oncology physician is to the patient: they have to assure the best

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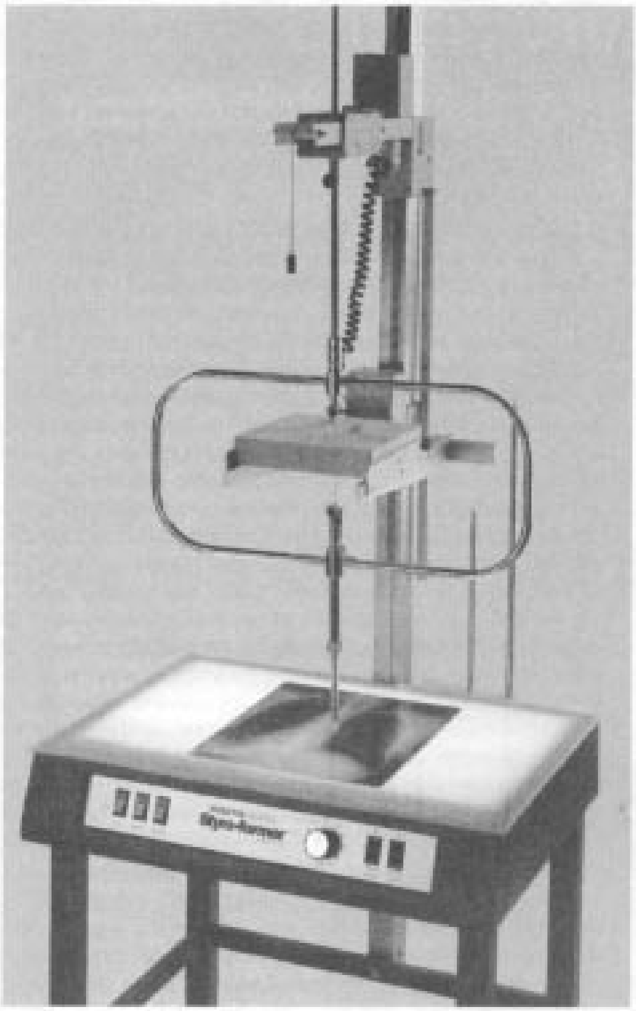

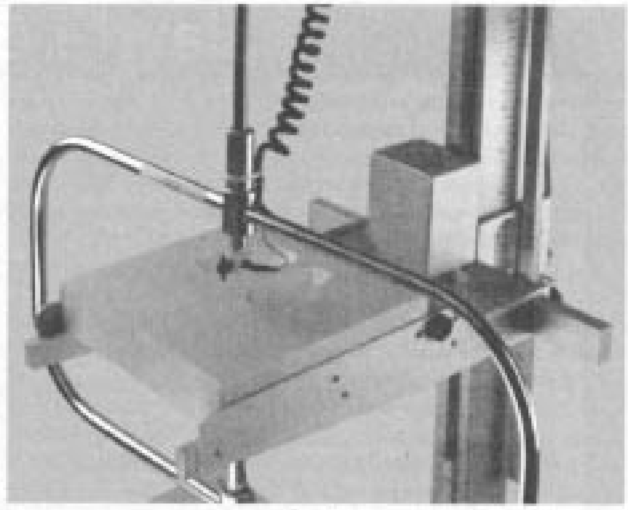

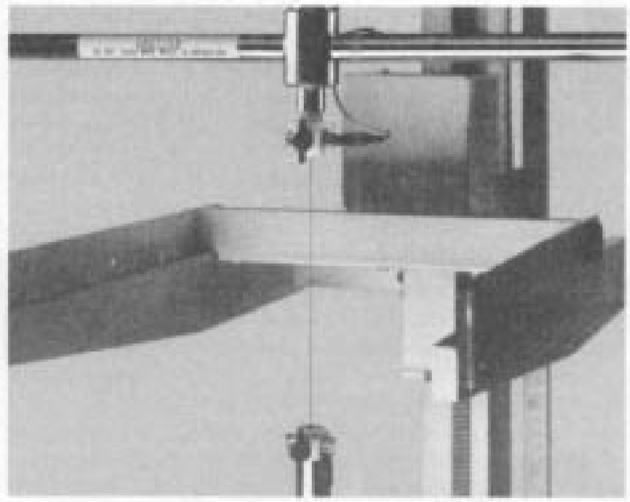

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Role and Responsibilities of Medical Physicists

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possible radiation treatment given the state of current technology, skills of the staff, and the resources available in the radiation oncology department. A radiation therapy physicist brings a unique perspective - that of a scientist trained in physics, including radiological and clinical physics - to the clinical team in a radiation oncology program to assure accurate delivery of all aspects of a treatment prescription. In *radiation therapy*, the radiation protection of the patient is achieved by delivering an accurately prescribed dose (within 5%) to the organ/tissue of interest while minimizing the dose to the surrounding uninvolved organs/tissues. Because of potential serious patient injury in radiation therapy, the radiation treatment beams have to be planned by qualified medical physicists who give consideration to individual patient specifics. Because of the ever-increasing complexity in treatment planning computer systems as well as treatment delivery equipment, <u>skills and training of qualified medical physicists need to be updated on an ongoing basis.</u> With proper education and training of the physicists, accidental overexposure of large number of patients, such as the one that occurred in Costa Rica in 1996, could have been avoided.

Radiation therapy physicists are involved in measuring and calibrating radiation doses from radiation producing equipment such as Cobalt machines, linear accelerators, simulators, CT-Sims, as well as brachytherapy sources and equipment such as low-, medium-, and high- dose rate (LDR, MDR, and HDR) and intravascular devices. Following the guidelines and protocols provided by scientific organizations medical physicists measure head and collimator leakage, MLC (multi-leaf collimators) leakage / interleaf leakage for these increasingly complex equipment to ensure patient protection from unnecessary radiation. Physicists also perform characterization of radiation treatment beams by measuring and determining various treatment parameters such as beam quality/ energy, depth dose characteristics of radiation beams, field size/shape dependence of radiation beams, characteristics of beam modifiers (such as physical wedges, universal wedges, and dynamic wedges), and intensity modulation of radiation beams in IMRT (Intensity Modulated Radiation Therapy).

In *radiation therapy*, medical physicists are also involved in providing radiation oncology physicians with optimal treatment plans using treatment planning computers with complex calculation algorithms that have inherent limitations in estimating patient doses under all possible conditions or configurations. The limitations in the existing dose calculation algorithms need to be understood and tested. Assurance of the accuracy of treatment parameters (so-called Quality Assurance) in radiotherapy, including correct transfer of parameters between the simulator, treatment plan and the treatment machine, and periodic reviews of each patient's chart are the responsibility of medical physicists. As part of quality assurance, medical physicists often have the output of the radiation treatment beam(s) checked independently either by another qualified medical physicist or by utilizing TLD mailing services [13,14].

Medical physicists are also involved in the *in-vivo* dose measurements of radiation patients using devices such as films, diodes, TLD (thermoluminescent dosimeters). Use of these devices requires special knowledge and expertise. Acceptance testing, commissioning of any radiation producing equipment and use of any measuring devices in radiation therapy requires also careful application and attention of medical physicists. The role and responsibilities of medical physicist in radiation therapy have been described in details by scientific organizations in many publications [15,16]

<u>Protection of Patients in Nuclear Medicine:</u>

In *nuclear medicine*, qualified medical physicists are involved in testing of all imaging equipment used in nuclear medicine. They also monitor the performance of the equipment on a periodical basis to ensure that everything is functioning within the manufacturer's stated specifications and acceptable performance standards. In diagnostic nuclear medicine – intended for planar as well as tomographic imaging - the goal is to produce the diagnostic images of the highest possible quality consistent with the clinical use of the equipment and to obtain the intended information from the examination. In general, the level of the radiation dose to the patients undergoing nuclear medicine examinations is very low. Therefore, the level of patient protection required in diagnostic nuclear medicine should be on a par with the level of radiation doses.

Furthermore, in nuclear medicine procedures with therapeutic intent, the medical physicist is responsible for preparing a table of organ doses for all the procedures that involve administration of radiopharmaceuticals to patients. The table is specific to the dosage schedule used at the facility. Keeping in mind that models - Monte Carlo or otherwise – used for organ calculations assume standard weight, height, size, shape of a standard man, woman, and child. Thus separate tables for patient size and gender are needed. Due to the complexities involved in calculating patient/organ doses in therapeutic nuclear medicine, the radiation protection of patients should be the responsibility of a qualified medical physicist.

<u>Protection of Patients in Diagnostic and Interventional Radiology:</u>

In *diagnostic* and *interventional radiology*, qualified medical physicists are involved in the process of optimizing the radiation used for imaging. This involves several specific actions. The first is to ensure that the quality of images is adequate for the specific clinical objective. This is achieved through consultation on the selection of appropriate imaging equipment, evaluation of equipment performance in the context of quality assurance programs, and the education of medical and technical staff on the appropriate imaging procedures and protocols. The primary objective is to ensure that an examination produces the necessary diagnostic information without the application of unnecessary radiation to the patient. A physicist determines the amount of radiation used for the different types of examinations. These data are used to ensure that sufficient exposure levels are used to produce the required diagnostic information and that appropriate patient dose limiting techniques are being applied. A related function of medical physicists in diagnostic and interventional radiology is to ensure that medical and technical staffs are utilizing appropriate practices to control the levels of radiation to which they are exposed. The medical physicist is a major source of information and consultation resource to the clinical staff on the reduction of the risk associated with inadequate image quality and incorrect, an often life treating, diagnoses. Through this process the medical physicist guides the use of radiation so that it is optimized to produce the necessary diagnostic information without unnecessary human exposure

In *diagnostic radiology*, physicists are responsible for monitoring and evaluating the patient exposures and comparing them with the published surveys for similar examinations and calculation of specific organ doses for diagnostic procedures and/or for specific patient. The entrance skin dose (ESD) is still by far the simplest indicator of patient's injury. The ESD can be measured directly with TLD or ionization chamber. It can also be estimated from the dose-area product (DAP). These quantities are used to determine the radiation risk. The ESD and DAP can be used for comparison purposes with published values such as Reference Values (RV) [AAPM Task Group Report in progress]. The US adopted RVs are similar to the Diagnostic Reference Levels (DRL) recommended by the European Commission's Medical Exposure Directive. The RVs and DRLs are not and should not be regarded as regulatory limits. They provide upper level guidelines of patient exposure that should initiate facility investigation when the exposure is exceeded. The RVs and DRLs are established based on the judgement of medical physicists and imaging physicians for standard imaging protocols. These protocols are based on some standard conditions (such as phantom size and group of patients) with consideration to adequate image quality. However, we must realize that RVs and DRLs will vary depending on the available technology, and may not exist for all procedures that are currently performed in radiology. Moreover, we must recognize that the ESD is strongly dependent on the patient's thickness and beam quality. Thus any arbitrarily reduction in the ESD can result in an increased noise (or loss in contrast) and therefore loss in image quality. There are times, however, that patient dose can be reduced without a substantial loss in image quality. The medical physicist is the best-suited individual to monitor patient doses and to reduce them (if possible) without substantially compromising efficacy of diagnostic procedures. Medical physicists are also in charge of patient safety - including radiation, mechanical, and electrical safety. They assist physicians in the evaluation of quantitative studies, such as the measurement of cardiac ejection fraction. In addition they are responsible for initial and continuing education of the physician and imaging staff to ensure efficient and proper use of radiation producing equipment.

In *interventional radiology*, an increasing number of invasive procedures, mostly with therapeutic intent, involve the use of medical devices under fluoroscopic guidance. These procedures, typically involving extended fluoroscopic time, are performed by a variety of medical specialists who may not

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Asia-Oceania Federation of Organizations for Medical Physics (AFOMP)

Kin Yin Cheung, Ph.D., President, AFOMP

The Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) was founded on May 28, 2000. The formation of AFOMP marks a new century for the medical physics communities in the Asia and Oceania regions. The formation of AFOMP aims to provide a solid platform for closer collaboration and mutual support amongst the medical physics organizations in the Asia and Oceania regions, particularly in the promotion and development of their standard of practice and professional status. The medical physicists in these regions constitute no more than 20% of all the medical physicists in the world, and provide medical physics services to more than half of the world's population.

The formation of AFOMP is only possible with the enthusiastic and cohesive efforts of medical physicists, especially during the embryonic stage. IOMP, particularly with the initiatives of Professors Colin Orton and Gary Fullerton and members of its Science Committee played an important role in promoting the formation of an Asian regional chapter of IOMP. Dr Akira Ito (Japan),Professors Raymond Wu (USA) and Barry Allen (Australia) were amongst the first to explore such possibility with the leaders of the medical physics communities in the region. On October 5, 1999 during the International Conference on Medical imaging, Dr. Ito together with Dr. Kwan Hoong Ng (Malaysia) were able to organize a meeting for a group of Asian physicists to discuss this subject. Representatives from China, Hong Kong, Japan, Korea, Malaysia, and Thailand were present at the meeting to exchange ideas on scientific collaboration and on the possibility of formation of a regional medical physics organization. Advice and encouragement were given by Dr. Geoffrey Ibbott, the then President of AAPM, Dr. Carridad Borras, Chairperson of the IOMP Science Committee, Professors William Hendee and Nanzhu Xie, Co-Presidents of the Guangzhou International Conference, who attended the meeting as observers.

The second meeting of the physicist representatives in the Asia and Oceania regions was organized by Professor Raymond Wu and Professor Yimin Hu (China) and was held on May 28, 2000 during the 2nd Beijing International Congress on Medical Radiation Physics, Beijing, China. The meeting was attended by representatives from eight medical physics organizations from Australia & New Zealand, China, Hong Kong, Indonesia, Korea, Singapore, and Taiwan and was chaired by Dr. Kin Yin Cheung (Hong Kong). The meeting voted unanimously in favor of forming a regional medical physics federation and the name chosen was Asia-Oceanic Federation of Medical Physics Organizations (AFMPO). The meeting also endorsed the affiliation of the Federation to IOMP as one of its regional chapters. A Protem Committee was established and was charged with the responsibility to draft the constitution as well as to prepare for the first general meeting to be held in Chicago during the 2000 World Congress on Medical Physics and Biomedical Engineering. Shortly after the Beijing meeting the medical physics organizations in Bangladesh, Philippines, Japan, Malaysia, and Thailand also became members of the Federation. The Medical Physics Association of India also became a member during the Chicago meeting.

The Federation held its first Council Meeting during the World Congress in Medical Physics and Biomedical Engineering in Chicago on 24 and 25 July 2000 with the participation of the representatives from 12 member organizations. Drs. Colin Orton, Geoffrey Ibbott and Professor Raymond Wu also attended the meeting as observers and gave their support and encouragement. Many issues of common interest had been discussed at the meeting and it turned out that the two-session meeting was too short to cover all the issues. The meeting elected Kin Yin Cheung as the President of Federation, Barry Allen the Vice-President, Akira Ito the Secretary General, and Anchali Krisanachinda (Thailand) the Treasurer. The meeting also adopted a new name for the Federation, namely Asia-Oceania Federation of Organizations for Medical Physics (AFOMP).

On July 26, 2000 at its Council Meeting in Chicago IOMP officially recognized AFOMP to be one of its Regional Chapters.

AFOMP is charged with the important task of promoting medical physics and the collaboration of the medical physicists in the Asia and Oceania regions on scientific and professional issues. Matters such as development of professional status, setting standards to meet the criteria, scientific research and development, medical physics services and service standards, training and certification or registration of physicists, scientific meetings and conferences are of common interest and are possible areas of mutual collaboration and support. Many of these issues are to be discussed in November 2001 when AFOMP will hold its second Council Meeting. To mark this meaningful event, the Thai Medical Physicist Society has been selected by AFOMP to host the meeting in conjunction with a scientific meeting entitled "First Asia Oceania Congress of Medical Physics" which will be held in Bangkok, during November 14-16, 2001.

Information about AFOMP, its goals and objectives, constitution, officers, membership, and sponsored and supported activities are given in the AFOMP Web site: http://ns2.jfcr.or.jp/afomp/

European Medical Physics Short Course Quality Assurance In Contemporary Imaging and Radiotherapy

Dr Slavik Tabakov, FIPEM, Chairman IOMP Education and Training Committee

The short course was organized as a satellite event to the European Congress of Medical Physics and Clinical Engineering at Belfast (11 to 15 September 2001). The course was supported by the International Organization for Medical Physics (IOMP), its Regional Chapter - the European Federation of Organization for Medical Physics (EFOMP) and also by the Institute of Physics and Engineering and Medicine (IPEM) and the Association of Physical Scientists in Medicine (APSM). The course was co-sponsored by IOMP through the Education and Training Committee (ETC). Other sponsors included Queen University of Belfast, University of Ulster and medical technology companies. Due to this support 14 bursaries were offered to young physicists from Central and Eastern Europe. The aim of this short course was to familiarize course participants with Quality Assurance requirements, methods and procedures in contemporary imaging and radiotherapy. It also considered bringing together of these activities across Europe, particularly between the European Union Countries and other European Countries. A number of sessions took integral part of the Congress and were open to all Congress attendees at no additional charge.

The Course Organizers were P Smith, S Tabakov, J Winder, F Nusslin, A Perkins, S Sherriff, P Zarand. The course faculty included the above plus CA Lewis, G Wilson, J De Wilde, T Whittingham, P Sprawls, P Jarritt, A Workman, I L Lamm. All faculty members presented the lectures free of charge. The course was attended by 43 delegates from 19 countries (some outside Europe) and additionally the open sessions attracted a similar number as well.

The first part of the course presented the philosophy of Quality Assurance, the ISO 9000 quality requirements and the QA emphasis of the new Euratom Directive 97/43 on Medical Exposures. The second part of the course discussed specific quality control procedures in Diagnostic Radiology, Nuclear Medicine, Radiotherapy and non-ionizing imaging methods. The course also presented the new developments in the field as CR and DDR quality control and the necessities for organizing QA program. The feedback from the course was positive and further national QA activities and courses were discussed with the delegates.

All course attendees were encouraged to follow the special joint Symposium of IOMP/AAPM/EFOMP on Education, Training and Professional matters. This symposium, extended over 3 sessions, attracted large audience and triggered many interesting discussions. The symposium was a joint activity, initiated by the IOMP ETC and PRC Committees and co-sponsored through the IOMP Professional Relations Committee (PRC). The Symposium was attended also by the IOMP Vice President and General Secretary and by most of the EFOMP officers. It was agreed that similar events would be included in other International Conferences. The last day of course was at the Northern Ireland Medical Physics Agency, which kindly provided most of the logistics and local organization.

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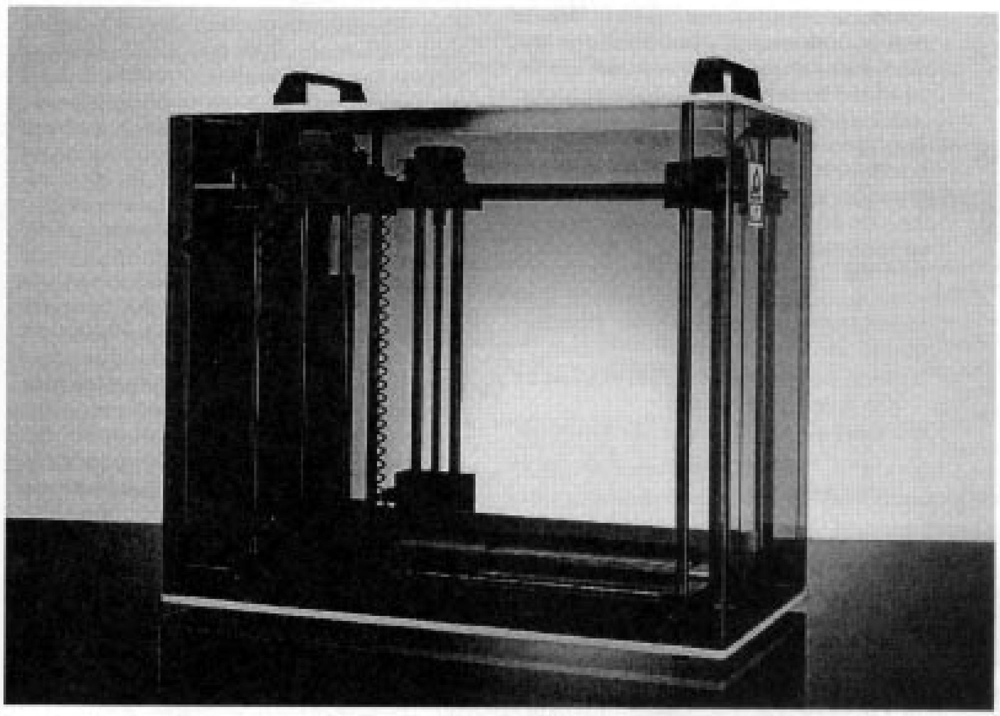

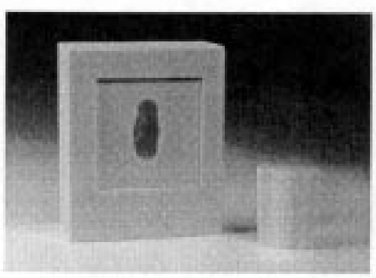

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Role and Responsibilities of Medical Physicists

(Continued from page 6)

have proper training in the use of radiation. As the number of interventional procedures has increased in the recent past, medical physicists have become concerned about patient's radiation exposure in these procedures. Fluoroscopic devices can deliver radiation at a very high rate of 10 cGy per min. The physicians need to become aware of the potentially serious radiation-induced skin injury caused by long periods of fluoroscopy employed in these procedures. Also, in recent years, with the increased use of mobile CT (Computed Tomography) in surgical procedures, the doses to the patients have increased considerably. Patients are often unaware that they are exposed to radiation and thus are uninformed of the ill effects of radiation in their procedures.

Examples of interventional procedures, that typically require extended fluoro exposure time, include, but are not limited to, angioplasty (coronary and other vessels), cardiac ablation, vascular embolization, stent placement, endoscopic cholangiopancreatography, biliary drainage, and urinary or biliary stone removal. Although, angioplasty often takes about 45 minutes, on some occasions the procedure may last several hours. The types of injuries to the skin and adjacent tissues, which may result from long exposure to fluoro have been reported.

The absorbed dose rate in the skin from a direct beam of a fluoro is typically between 2 to 5 cGy/min, but may be as high as 50 cGy/min, depending on the size of the patient and the mode in which the fluoro is operated. In addition, many fluoro-guided procedures involve image recording (fluorography) using films or digital means to record images permanently. The recording modes usually involve much higher dose rates than those used in fluoroscopy. Contributions from fluorography must also be included in assessing the total absorbed dose to the skin.

Radiation injuries, with onset of months or years after the interventional procedures, cannot be diagnosed easily. When symptoms of injury occur, most interventional physicians may not be in direct contact with the patients. Therefore, many of them are unaware of the potential radiation injuries to their patients. In addition to skin injuries, there is an increased risk of late effects, such as radiation-induced cancers in other tissues and organs. The potential for such late effects should be considered in the risk/benefit analysis, especially in pediatric and young adult patients, or in procedures involving exposure to radiosensitive tissues such as breast. For these reasons, in 1994, the US Food and Drug Administration (FDA) issued a public health advisory warning physicians about the potential risks of fluoro irradiation. The agency recommended that institutions:

(1) Adopt standard procedures and protocols for each fluroscopic procedure,
(2) Determine radiation dose for each fluoroscope,
(3) Evaluate treatment plans to gauge the risk of radiation injury,
(4) Change treatment plans to reduce that risk,
(5) Record in each patient's file the information needed to calculate the absorbed dose of radiation to the skin and other organs.

But it should be noted that the FDA has no authority to force physicians or institutions to honor these recommendations. It is worth noting that the interventional procedures could also result in an increased occupational exposure to physicians and staff, which is of concern to medical physicists.

Summary Statements:

A major concern of medical physicists in any subfields of radiation medicine - radiology, interventional radiology, nuclear medicine, and radiotherapy - is to protect patients from unwarranted radiation. To achieve this, IOMP concurs with the European Commission's Medical Exposure Directive [97/43/EURATOM (MED), 1997] requiring the services of *qualified* medical physicist at *all* radiation facilities. Furthermore, the IOMP recommends adaptation of such a policy by regulators and government agencies. The IOMP also recommends establishment of a comprehensive Standard Operating Procedures Manual for each specific radiation procedure in any radiation facility. The protocols should be consistent with the scientific and professional standards, which are established by national and international organizations. The Standard Operating Procedure Manual should address all aspects of the radiation procedures including, but not limited to, patient selection, normal conduct of the procedure, action levels in response to the complications, calibration procedures for all radiation producing equip-

(Continued on page 11)

Role and Responsibilities of Medical Physicists

(Continued from page 10)

ment and radioactive sources, quality assurance checks of the equipment and dose measuring devices, dose calculation protocol, *in-vivo* dose measurement, monitoring, evaluation, and documentation of patient dose(s), safety programs, emergency procedures, patient education, and staff continuing education. We recognize that each radiation facility is unique. Therefore, the Standard Operating Procedure Manual must be individualized based on the resources and goals of the program. However, the basic principles of monitoring and evaluation of the patient doses as well as of the outcomes must be addressed on an ongoing, formalized, systematic, and comprehensive manner. The Manual should also include sample quality assessment and improvement plans that lend themselves to a multi-disciplinary problem solving approach that is consistent with the continuing quality improvement philosophy at a radiation facility.

In conclusion, the IOMP endorses any effort that promotes safe use of radiation while minimizing the unnecessary dose to the patients and staff. The IOMP denounces any arbitrary imposition of radiation limits by the regulators that would limit the ability of physicians and medical physicists to provide optimal therapeutic or diagnostic radiation to the patient.

Secretary General's Report

Gary D. Fullerton, Ph.D.

FINANCIAL AUDIT OF CHICAGO 2000: The Organizing Committee for the World Congress Chicago 2000 submitted their audited financial report on the congress to IOMP. Dr. William Hendee and Dr. Willis Tomkins, Congress Co-Presidents, were pleased to report payment of the IOMP service charge of $17,500 as well as the IOMP profit share of $41,098. These payments were ahead of schedule and the profit share was larger than expected. These funds significantly bolster the ability of IOMP to expand support of regional programs in the coming two years. We thank our American colleagues for their successful efforts in support of IOMP.

EXPANSION OF REGIONAL PROGRAMS IN 2001: The Education and Training Committee as well as the Science, and Professional Relations Committee all report multiple regional programs in conjunction with the support of Regional IOMP Chapters or clusters of national members. More than 12 regional programs were sponsored or endorsed by IOMP at locations around the world. Details of these programs are posted on the IOMP web page at http://www.iomp.org. The Executive Committee thanks the committees for their hard work and encourages additional submission of grant applications to support programs in 2002.

NEW IDEAS FOR 2002: The IOMP Council is considering multiple options to extend the range of activities to more successfully achieve IOMP Goals. One proposal is to consider sponsorship of a biennial World Congress for Medical Physics (WCMP). These medical physics congresses would be held in conjunction with one of the IOMP Regional Chapters but only in those years that do not conflict with the World Congress for medical Physics and Biomedical Engineering. The firs WCMP could be as early as 2005. The IOMP Executive Committee would be pleased to know your opinion and views regarding the above mentioned events or any other programs that could serve the needs of IOMP members.

Education and Training Committee Report (ETC)

Slavik Tabakov, Chairman IOMP ETC

The IOMP Education and Training Committee supported several activities in the period April 2001 - September 2001 These included: Medical Physics Workshop "Continuous Quality Improvement in Medical Imaging and Radiation Therapy" in Kuala Lumpur; Medical Physics Training and Education, satellite to the 1st Euro-Asian Congress "Medical Physics 2001" in Moscow, Russia; European Short Course "Quality Assurance in Contemporary Imaging and Radiotherapy" satellite to the European Congress on Medical Physics and Engineering, Belfast, UK (for details see further in the text).

Three other activities were approved by ETC as IOMP endorsed activities - Refresher Courses on Medical Physics and Diagnostic Imaging in Bangkok, Thailand, satellite to the First Asia Oceania Congress of Medical Physics (AOCMP); Radiation Therapy Physics Course and Workshop in Riyadh, Saudi Arabia; Workshop on 3D Conformal Radiation Therapy and Intensity Modulated Radiation Therapy in Mumbai, India.

ETC is continuing the collection of Graduate Education Programs for the Global Directory and encourages all colleagues to submit information about their courses.

Status AAPM/IOMP Libraries – October 1, 2001

Marilyn Stovall, Ph.D., M.D., Curator of IOMP Libraries

We currently have 88 active libraries in 52 countries; a library in China is the most recent addition. Since last quarter, two donations have been completed and one is in progress.

Our contact at IOPP is Julia Tancock, who coordinates donations of books to new and existing libraries; all new libraries receive at least five books from IOPP. Kathy Burroughs at AAPM coordinates the donations of Medical Physics journal subscriptions. During the first quarter each year, she tells us how many AAPM members donated their subscriptions of Medical Physics to the Library Program. The Society for Radiological Protection notified us that they have mailed the September issue of their quarterly publication, The Journal of Radiological Protection, to all active libraries.

We are enhancing the libraries' access to information by means of the Internet and CD-ROMs. During the last year, we mailed a total of 5 CDs to all active libraries. There are still sufficient copies of 4 of the CDs for an additional dozen shipments and we send these to new libraries as they are established.

At the end of August, the 68 libraries with e-mail addresses on file were contacted for confirmation of a current e-mail address, requesting the information by 9/30/01. We also are waiting for several libraries to respond to the update questionnaire mailed in August 2000. All libraries will be contacted again regarding addresses.

Anyone wishing to donate materials or establish a library is asked to contact the curator.

Calendar of Events

Carter Schroy, Associate Editor

22-23 March 2002
Int'l Conference on Radiological Protection of Patients in the Use of Ionizing Radiation; Lucknow, India http://www.geocities.com/icrp2k2/icrp2k2.htm; akshukla@SGPGI.AC.IN

2-5 May 2002
Annual Symposium of the Society for Computer Applications in Radiology; Cleveland, OH USA info@scarnet.org; http://www.scar.rad.washington.edu/

9-11 May 2002
Annual Brachytherapy Meeting of GEC/ESTRO; Antalya, Turkey http://www.estro.be/estro/Frames/events.html; info@estro.be

18-24 May 2002
International Society for Magnetic Resonance in Medicine 10th Scientific Meeting and Exhibition; Honolulu, HI info@smr.org; http://www.ismrm.org

9-11 June 2002
UK Radiological Congress (UKRC 2002); Birmingham, UK http://www.ukrc.org.uk; conference@ukrc.org.uk

26-28 June 2002
16th Int'l EURASIP Conference BIOSIGNAL 2002; Brno, Czech Republic http://www.fee.vutbr.cz/UBMI/bs2002.html; ivo@ieee.org

27-29 June 2002
7th International Workshop on Electronic Portal Imaging - EPI2K2; Vancouver, BC Canada http://www.epi2k2.ca/; rrajapak@bccancer.bc.ca

14-18 July 2002
American Association of Physicists in Medicine Annual Meeting; Montreal, Canada. aapm@aapm.org; http://aapm.org

9-14 September 2002
10th International Symposium on Neutron Capture Therapy; Essen, Germany w.sauerwein@UNI-ESSEN.DE

17-21 September 2002
21st Annual ESTRO Meeting; Praha, Czech Republic
http://www.estro.be/estro/Frames/events.html; info@estro.be

6-9 October 2002
American Society for Therapeutic Radiology and Oncology Annual Meeting, New Orleans, LA USA
georgettes@astro.org; http://www.astro.org

1-6 December 2002
Radiological Society of North America Annual Meeting, Chicago, IL USA http://www.rsna.org

10-16 May 2003
International Society for Magnetic Resonance in Medicine 11th Scientific Meeting and Exhibition; Toronto, Canada. info@smr.org; http://www.ismrm.org

1-6 June 2003
World Federation for Ultrasound in Medicine and Biology; Montreal, Canada http://www.wfumb.org.au/congress.htm

19-21 August 2003
Workshop on Recent Advances in Absorbed Dose Standards (ARPANSA); Melbourne, Australia. http://www.arpansa.gov.au; robert.huntley@health.gov.au

24-29 August 2003
World Congress of Medical Physics & Bioengineering, Sydney, Australia
www.wc2003.org; B.Allen@unsw.edu.au

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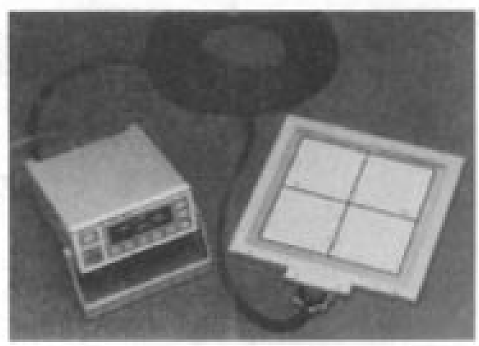

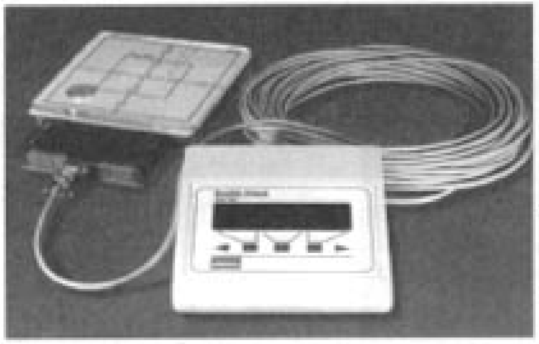

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Cancer Care Ontario

Cancer Care Ontario's nine regional cancer centres are the foundation of one of the world's largest cancer treatment, research, and education organization. The centres are located in Ontario's major regional centres - Toronto, Hamilton, Kitchener, London, Windsor, Kingston, Ottawa, Sudbury, and Thunder Bay. Four additional centres in Mississauga, Oshawa, St. Catharines and Sault Ste. Marie are expected to open starting in 2003.

Princess Margaret Hospital
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Princess Margaret Hospital is Canada's largest teaching hospital and research facility exclusively devoted to cancer treatment, research and education. The hospital houses 14 linear accelerators and 3 cobalt 60 units, as well as 3D treatment planning and simulation facilities.

Ontario centres have been pioneers in the development of new radiation sources, digital portal imaging systems, tools for radiosurgery, and dose calculation algorithms for 3D treatment planning now used on computer systems worldwide. Some centres are involved with laser photodynamic therapy and radiobiology research programs.

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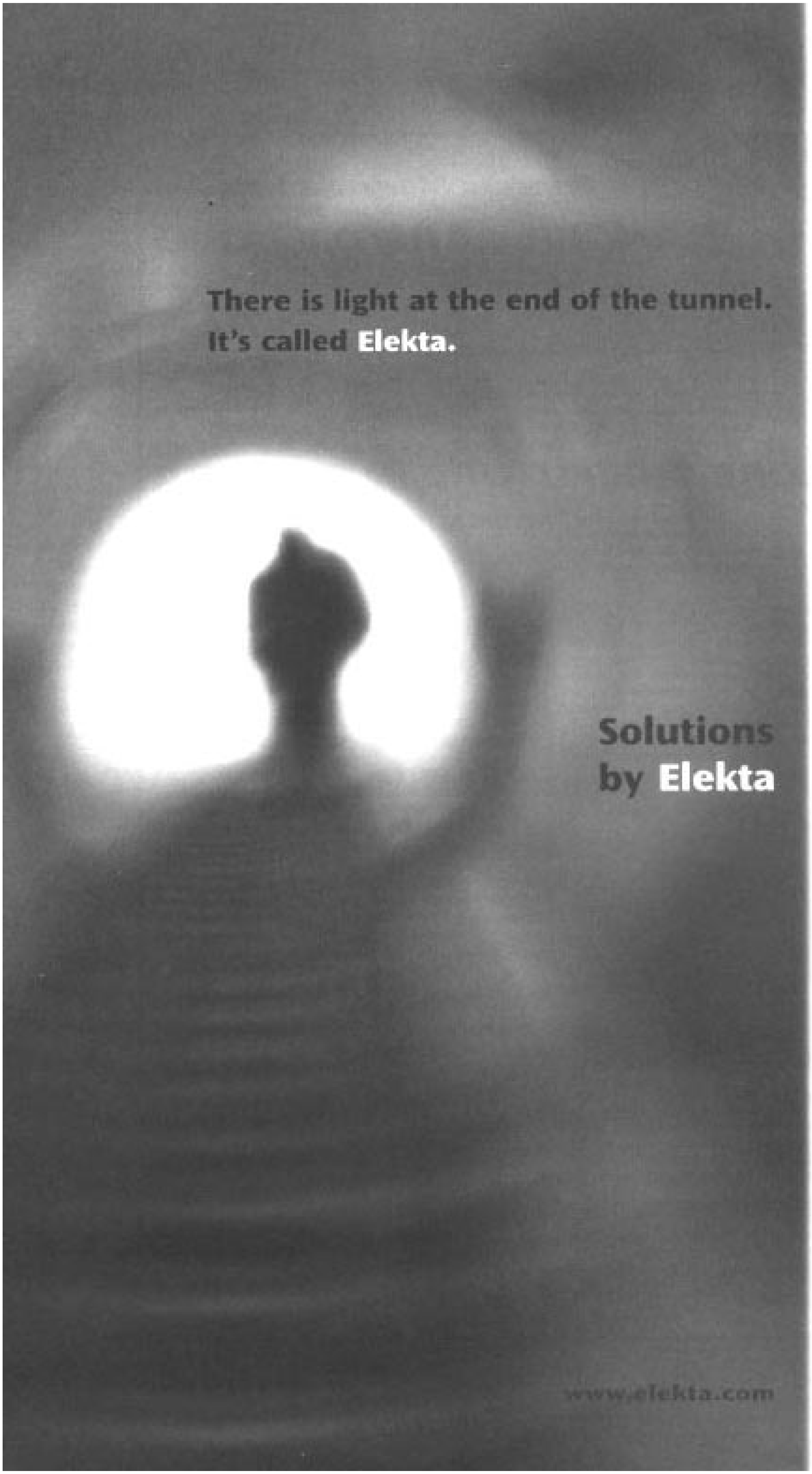

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Publication Committee Brief Summary Report

Gino Fallone, Chairman, Publication Committee, Alberta Canada

Our deliberations have been mainly concerned with the implementation of official IOMP journals. The prospect of having the Journal of the American College of Medical Physics (JACMP) become an official journal of the IOMP is under review and discussions by both the IOMP and the JACMP officials. We have virtually agreed on a policy that would be beneficial to the IOMP as well as to the journal in question. We hope to make an official statement on this issue for our next report.

DONATION OF USED EQUIPMENT – PRC Report for July-December 2001.

Dr. Zaidi attended the AAPM annual meeting in July 2001 held in Saltlake City, Utah, USA and was impressed that our vendors are anxious to help IOMP equipment donation program and showed interest to donate any used equipment received during trade-ins. Thanks for participating in this great cause.

Plans are being developed to ship a Co-60 machine to Zambia and three Victoreen r-meters to India.

Equipment available:

Two Mevatron, Co-60 machine (2 Theratronic and a Picker C-9), Victoreen r-meters (3).

Equipment needed:

Block cutter, film densitometer, radiation field analyzer, direct patient dose monitor, rectal monitor, cavity chamber, TLD readers, ultrasound system with sectorial transducer, surgical aspiration system, gastroscope, cardiotocograph and micro-analyzer for blood, urine and biochemistry analysis.

Joint-venture proposal from India:

"We need support from IOMP to develop a Radiation oncology centre in India, even if there is any institution or individual who would be interested to donate equipment we can tie up with such institution/ individual and give them their name e.g. Indo-US joint venture." They need a used cobalt 60, mammography unit and a gamma camera.

The equipment available is in good working condition. The recipient has to pay for shipping and handling only. If you want to donate used equipment to IOMP or want some equipment donate to your organization, please contact Dr. Mohammed K. Zaidi at (208) 526-2132, Fax (208) 526-2548 or e.mail zaidimk@id.doe.gov

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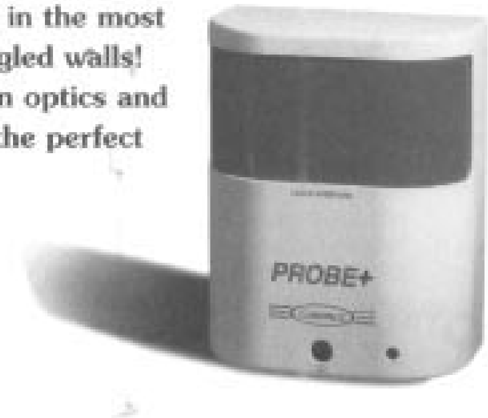

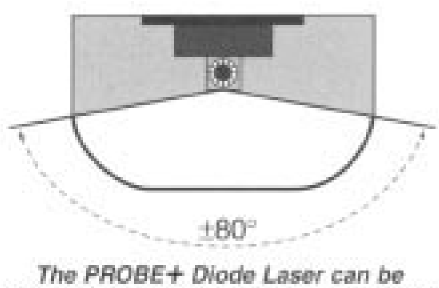

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