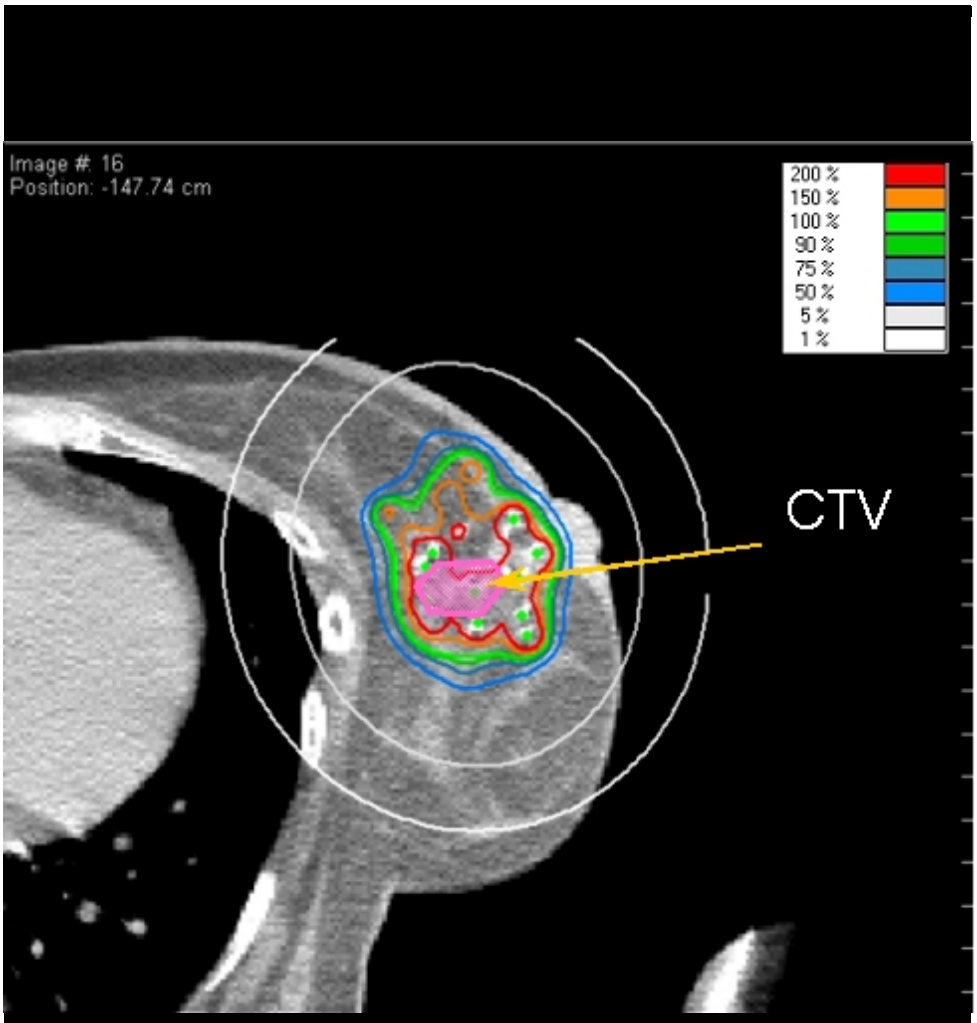
InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE



Pd-103 seed implant for the treatment of breast cancer

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LE COLLÈGE CANADIEN DES PHYSICIENS EN MÉDECINE

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About our Cover

On May 13, 2004, Toronto Sunnybrook Regional Cancer Centre became the first in the world to perform Pd-103 seed implant for the treatment of breast cancer. After receiving lumpectomy, the patient receives the seed implant to treat the tumor bed only, in lieu of external beam radiotherapy for the whole breast. The procedure, performed under local anaesthesia, takes about an hour in the operating room. The patient is released the same day and may return to work the next day. So far, twelve patients have received the treatment. A CT scan is performed immediately following the procedure and at 2 months following the implant to assess the dose distribution. The picture shows the post-op dosimetry. For more details, please read the article by William Que in this issue [p.27].

Images provided by Brian Keller, Raxa Sankreacha, and William Que, Toronto-Sunnybrook Regional Cancer Centre and Ryerson University, Toronto, Ontario.

The Canadian Medical Physics Newsletter, which is a publication of the Canadian Organization of Medical Physicists (COMP) and the Canadian College of Physicists in Medicine (CCPM) is published four times per year on 1 Jan., 1 April, 1 July, and 1 Oct. The deadline for submissions is one month before the publication date. Enquiries, story ideas, images, and article submissions can be made to:

Dr. Boyd McCurdy
CancerCare Manitoba
675 McDermot Avenue
Winnipeg, Manitoba, R3E 0V9
Email: boyd.mccurdy@cancercare.mb.ca
Phone: (204) 787-1966
Fax: (204) 775-1684

Members of the Editorial Board include:

Peter Munro:	peter.munro@lrcc.on.ca
Pat Cadman:	pcadman@scf.sk.ca
Darcy Mason:	dmason@bccancer.bc.ca

Please submit stories in Publisher 98, Word 6.0, Word 97, or ASCII text format. Hardcopy submissions will be scanned to generate an electronic document for inclusion in the Newsletter. Images in Tiff format at 300 dpi resolution are preferred.

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CancerCare Manitoba
675 McDermot Avenue
Winnipeg, Manitoba, R3E 0V9
Email: boyd.mccurdy@cancercare.mb.ca
Phone: (204) 787-1966
Fax: (204) 775-1684

Job advertisements should be submitted to:
Dr. Julian Badragan
Tom Baker Cancer Centre
1331-29 Street NW
Calgary, AB, T2N 4N2
E-mail: badragan@cancerboard.ab.ca
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Harry M. Johnson

Message from the COMP Chair:

I am happy to report that the executive has approved the creation of the COMP Gold Medal...

The mid-year meetings of both COMP and the CCPM were held on the last weekend of November in Toronto. There were several decisions made which will have a positive impact on the organization. In my original message I noted that COMP needs a way to recognize outstanding contributions to medical physics in Canada. I am happy to report that the executive has approved the creation of the COMP Gold Medal, to be awarded at our annual scientific meeting to a medical physicist who has made significant contributions to medical physics in Canada. This issue of Interactions contains more details about that award and a competition to design the award itself.

We now have agreement on the process that we will use to create the COMP archives. The COMP Professional Affairs Committee chaired by ***Peter McGhee*** has agreed to create a documents database that will house all active business documents (minutes, financial statements, codes of practice etc). When these documents are no longer active they will be passed to the executive director who will arrange to physically store the information. COMP will also have an archivist who will be responsible for collecting non-business COMP material (photographs, videos, plaques etc.) and passing it to the executive director for storage. I am pleased to report that ***Doug Cormack*** has agreed to act as the first official COMP archivist.

The process to hire a new executive director for COMP and the CCPM is well underway. This important new executive member will be our main administrative officer, responsible for day-to-day operations of COMP and the CCPM. I expect to be able to introduce the new executive director in the next Interactions.

Annual meetings are one of the main functions of our organization and I can report significant activity with regard to upcoming meetings. We are investigating joint meetings with CARO (2007), the AAPM (2011) and sponsorship of an IOMP meeting in Montreal (2012). Planning for next years meeting in Hamilton is well underway. ***Joe Hayward***, chair of the Local Arrangements Committee recently gave the executive a comprehensive presentation of the highlights of the meeting to be held at MacMaster University. For the first time, and in celebration of the World Year of Physics we will have a COMP Public Lecture, to be given by ***Dr. Michael Bronskill*** of Toronto. Please look for the first announcement of the meeting and the call for abstracts in this issue of Interactions.

Peter Dunscombe has been directing the production of Quality Control documents for radiation therapy equipment. These important documents will form an appendix to the document "Structural Standards for Quality Assurance at Canadian Radiation Treatment Centres (September, 2003). This report has been ratified by the board of the Canadian Association of Provincial Cancer Agencies (CAPCA) and the process for implementing the Standard is now being considered by the Standards Action Group (S-AG) of the Canadian Strategy for Cancer Control. COMP has been asked to work with the S-AG to facilitate the dissemination, uptake and implementation of this new Standard. As this process moves forward it is very important that you voice your opinions about both the QC documents and the new Standard to Peter Dunscombe or to a member of the executive.

Mr. Peter O'Brien, COMP Chair

Message from the CCPM President:

This year marks the **25th anniversary** of the first **Annual General Meeting of the CCPM**, held in Vancouver in 1979. I was reminded of this by **Margaret E. J. Young**, a founding member who became the first Chief Examiner and who wrote recently to thank us for eliminating the dues for emeritus members. From the original group of 6 founding members, the CCPM has grown steadily over the 25 years to a total of 216 this year, representing a large proportion of clinically employed Canadian medical physicists. Equally importantly, certification by the CCPM has attained worldwide recognition to the extent that we regularly receive enquiries from outside Canada. A good summary of the formation of the CCPM and it's relevance to Canadian medical physics can be found in "A New Kind of Ray, The Radiological Sciences in Canada 1895-1995", edited by JE Aldrich and BC Lentle, 1995, Chapter VI.

Dr. Brenda Clark, CCPM President

As I write this, I have just returned from the mid-year COMP/CCPM meetings, held at the end of November in Toronto. Clearly not the middle of the calendar year! This terminology has caused confusion in the past for new board/executive members. With only two face-to-face meetings per year, the other being immediately prior to the summer meeting, the term mid-year has become traditional.

This year, the CCPM board meeting was held on Friday, 26 November starting at 8:30 am, or 5:30 am for those of us from the west coast - one of the (few) disadvantages of living in lotus land! The meeting took all day, lunch was brought in and we adjourned just after 5pm. I hereby acknowledge the dedication and stamina of my fellow board members and thank them for giving up the best part of a weekend with their families to participate. Despite the constant use of email and occasional use of phone conferencing, we still find that our most valuable discussions and decision-making occurs at the two face-to-face meetings.

After this marathon, those of us who were not local went out to dinner with the members of the COMP executive who had arrived for their meeting during the day. These social interactions provide light relief after the relatively serious business meeting and certainly make the weekend entertaining. On the Saturday, the COMP executive met in the morning – they seem to be able to function with fewer meeting hours – and a joint meeting with both groups was held in the afternoon. The rationale for the joint meeting is to provide for appropriate collaboration and communication between the two groups. The finance and communications committees report to the joint meeting, while the remaining committees report to the COMP executive alone. For the many of you who may be thinking of volunteering for either the CCPM board or the COMP executive at some point in the future, I will assure you that although undoubtedly participation at the board level is work, it's also fun and provides a fascinating insight into the workings of the two organisations. Please contact me at any time if you are interested in participating.

You are probably wondering what we discussed that took so long! The agenda ranged from discussion of examination eligibility and formats, clearly our principal business, to ensuring transparency of our processes by such measures as increasing the clarity of our web site and publication of our policies and procedures. We have created a new position on the board, that of **Deputy Chief Examiner**. This is a response to the increased workload represented by the introduction of the oral exam and the need to provide for a smoother transition between Chief Examiners. Congratulations to **John Rowlands** who has agreed to become our first Deputy Chief Examiner. We also spent some time considering a more structured method to seek new board members. In the past, this process has

(Continued on page 32)

...certification by the CCPM has attained worldwide recognition to the extent that we regularly receive enquiries from outside Canada.

CALL FOR PAPERS

51st Annual Scientific Meeting of COMP and CCPM Symposium

July 6-9, 2005
Hamilton, Ontario

The Canadian Organization of Medical Physicists and the Canadian College of Physicists in Medicine are pleased to invite you to the McMaster University campus in Hamilton, Ontario for our 51st Annual Scientific Meeting. This year we are celebrating the World Year of Physics with a Public Lecture delivered by Dr. Michael Bronskill, Senior Scientist at Sunnybrook and Women's College Health Sciences Centre. The theme for the CCPM Symposium is Optical Diagnostics and Therapeutics and the symposium will feature internationally known researchers. The banquet will take place on the grounds of The Royal Botanical Gardens, a National Historic Site of Canada.

Abstract Submission:
A web-based abstract submission process will be used for the Hamilton meeting. Details will be available on the COMP website (www.medphys.ca) early in January 2005.

Registration:
Early registration will begin on February 1st and end on May 1, 2005. Please visit the COMP website (www.medphys.ca) for all details and information regarding the registration process.

IMPORTANT DATES

February 1, 2005	- Early registration and online abstract submission begins
March 15, 2005	- End of abstract submission
May 1, 2005	- End of early registration
July 6-9, 2005	- COMP meeting

Report on AQPMC Workshop

Submitted by Michael Evans
McGill University Health Centre,
Montréal, QC

On Monday November 15, the Association Québécoise des Physicien(ne)s Médicaux Cliniques (AQPMC) met for its first workshop entiltled "Contrôle de qualité pour accélérateurs linéaires / quality control for linear accelerators".

The AQPMC is the professional association that represents medical physicists primarily employed in health care institutions and this is the first time a separate meeting was held outside of the annual business and scientific meeting held traditionally in the spring. Organized by Nöel Blais and the physics group from Hôpital Maisonneuve-Rosemont in Montreal, the meeting was attended by 30 clinical physicists as well as another 40 or so graduate students in medical physics programs from McGill University, Université de Montréal and Université Laval. Attendance included physicists from radiotherapy clinics in Sherbrooke, Gatineau, Montreal, Quebec, and Chicoutimi.

There were four sessions during the day and the meeting opened with a welcome address by Nöel Blais, and the three sponsors (Elekta, Siemens and Varian) were thanked for their support.

The first session entitled "*Organisation des CQ dans les hôpitaux du Québec / Organization of QC procedures for Quebec hospitals*" , was moderated by William Parker, and presentations were given by physicists from each clinic. Speakers included Étienne Roussin (Hôpital Maisonneuve-Rosemont), Nasser Djennaoui (Hôpital Notre-Dame), Michael Evans (McGill University), Nicolas Varfalvy (Hôtel-Dieu de Québec), Luc Ouellet (Hôpital de Fleurimont), Patrice Jones (Complexe hospitalier de la Sagamie) and Jason Bélec (Centre hospitalier des Vallées de l'Outaouais). Following the last presentation the speakers participated in a general question and answer session with the audience.

The second session, moderated by Dr. Wieslaw Wierzbicki, entitled "*CQ pour les techniques spécialisées I : Radiochirurgie / QC for specialized techniques I : Radiosurgery*" included presentations by Horacio Patrocinio, (McGill University) and Fadi Hobeila, (Hôpital Notre-Dame) who spoke about linac-based radiosurgery. André Bertrand, (Hôpital de Fleurimont) presented Quality Control issues specific to the newly installed Gamma Knife unit at their institution. Following this session there was an open discussion with the speakers.

The meeting broke for lunch and a surprisingly enjoyable cafeteria lunch was experienced by all.

The first afternoon session (*Conférenciers invités pour/invited speakers for CAPCA Programme national d'assurance qualité/National program for quality assurance*) moderated by Dr. Ervin Podgorsak began with a presentation by Dr. Carolyn Freeman, Director of Radiation Oncology at McGill University. She presented some of the consequences of implementing an overall Quality Control program in radiation oncology and discussed the application of the CAPCA guidelines in general terms. Following this Dr. Clément Arsenault from Moncton presented an overall review of the CAPCA quality assurance recommendations and as the ex-Chair of COMP was able to give some insight into the problems associated with applying national guidelines for Quality Assurance in the Canadian health care context. Finally M. Bernard Lachance (head of clinical physics at CHUQ) reviewed some of the specific CAPCA guidelines and discussed some of the implications of implementing these in the specific context of cancer care delivery in Quebec. Following these talks there was a spirited debate related to some issues such as jurisdiction, enforcement and staffing. Dr. Podgorsak congratulated the speakers on turning what could potentially have been a very boring subject matter into one that kept everybody's interest up and generated a high level of opinion.

The final session of the day, moderated by Maryse Mondat, was an informal question and answer period among the audience relating to the implementation and QA procedures for IMRT. An informative discussion took place between the audience and physicists from McGill and Quebec involved in IMRT treatments, and a general comparison of current practice was presented.

Dr. Podgorsak congratulated the AQPMC organizers as well as the presenters for the high quality of the workshop and in particular applauded the younger participants for their professional work (high praise, I can tell you). The workshop was a success by any standard and plans are already underway for the next one.

ANNOUNCING

A competition to design……The COMP GOLD MEDAL

The executive would like to solicit your help in designing the COMP GOLD MEDAL – our highest award. A first description of the intent for the medal follows. We are hoping to award the first medal in 2006 with a call for nominations in the fall of 2005. Please send your ideas for the size, shape, composition and inscriptions for the medal itself and for the display case. A panel of the COMP executive will select the winning design and the winner will receive one free registration for the next COMP meeting in Hamilton (This will be transferable and includes attendance at the annual banquet). Submissions must be received at the COMP office by February 26, 2004. A picture of a similar medal (The Governor General' medal) is shown below, courtesy of Brenda Clark's daughter!

The Gold Medal will be awarded to an individual who has made a significant contribution to the field of medical physics in Canada. A significant contribution will be defined as one or more of the following:

1. *A body of work which has added to the knowledge base of medical physics in such a way as to fundamentally alter the practice of medical physics in Canada.*

2. *Leadership positions in medical physics organizations which have led to improvements in the status and perception of medical physicists in Canada*

3. *Sustained leadership in the education of medical physics graduate students and/or residents in Canadian institutions.*

The Gold Medal will be the highest award given by the Canadian Organization of Medical Physicists and will be given to individuals to recognize an outstanding career as a medical physicist who has worked mainly in Canada. It will be awarded as appropriate candidates are selected but it will not be given more than once per year.

Applications for the medal will be solicited once per year through a notice in the COMP newsletter (INTERACTIONS). Applications must be made by at least one sponsoring individual and will require documentation of the contributions of the candidate in one or more of the areas listed above.

A committee of COMP members appointed by the COMP executive will consider applications and recommend award winners to the COMP executive.

Candidates selected for the medal will be invited to attend the annual COMP meeting where the award will be presented by the COMP chair. All expenses will be paid for the medal winner. The medal winner may be asked to give a presentation at the COMP meeting.

Report on ASTRO 2004

Submitted by Pat Cadman
Saskatoon Cancer Centre, Saskatoon, SK

I recently attended the 46th annual ASTRO meeting in Atlanta. Although I am always eager to be part of this meeting from a professional perspective, I was also excited about this year's ASTRO for reasons that have very little to do with radiation oncology. A short distance from Atlanta, at a recreational area known as Stone Mountain Park (see Figure), I received a true southern cultural treat. The annual Chili cook-off simmered away throughout Saturday, complete with music from my all-time favorite band *Little Feat* (going strong since 1969). I felt that it was my duty and honor to represent Canadian medical physicists and you should know that your esteemed taster did his best to sample well ever 100 local chili creations and Brunswick Stews (like chili, but with a distinctive BBQ sauce support). I believe I served you well in this respect. At the end of the day I was stoked and ready for the next 5 days and any intellectual and gastronomical challenges that ASTRO might throw at me.

For me, ASTRO is really a chance to see how the field of radiation oncology is evolving and how outstanding clinical questions are being addressed. We all spend a lot of time reading journal articles and vendor marketing literature in isolation throughout the year and ASTRO gives us a chance for direct contact with other radiation oncology professionals (just talk to the person next to you) and even the occasional guru. Whether rushing along between sessions, queuing at the coffee bar or relaxing at the pub, the chance for discussion is only a nametag glance away. What is the deal with all that cone-beam stuff at PMH? Who is that new guy from Calgary? Is Saskatoon really the center of the Universe? You need only to say hello and an interesting conversation is sure to surface.

Almost every significant radiation oncology topic is discussed at a scientific, educational or poster session at ASTRO. The only problem is that these sessions often run in parallel so it might be best to use the buddy system to try and cover it all. You can always discuss your finding later over a cool beverage (did someone say 7:00 at Max Lagers?). This year, I tended to focus on the sessions dealing with IMRT, image guided radiation therapy, head and neck cancer and anything with "4D" in it, but the choices extend to the more general and traditional radiation oncology themes.

I found it very interesting that there are now scientific sessions on topics that, only a short time ago, didn't even have a stable terminology including: 4-D Treatment Planning, 4-D Deformation, Adaptive Radiation Therapy, etc. One interesting session was titled "In-room Volumetric Targeting", which focused entirely on cone-beam CT techniques for image-guided treatments. The discussant who reviewed the material at the end of the session, Rock Mackie of TomoTherapy Inc., was provided with a chance to include tomotherapy-based techniques, since non-cone-beam presentations seem to have been excluded from the session.

Figure 1: Stone Mountain Park, GA. One of largest granite outcropping in North America depicts three Confederate heroes of the American Civil War.

Thank goodness there were education sessions to help guide us through the myriad of new and emerging technologies and provide a good primer to the vendor wares downstairs. One such session: "Target Localization Systems for Radiation Therapy Treatments", by Michael Herman and Michael Sharpe, did a very nice job of covering the evolution systems and methods for target localization. Some of the educational sessions supported audience interaction where delegates were able to participate directly using an electronic input device (I wish I had practiced on my son's Nintendo before I came). I remember attending the 2002 ASTRO in New Orleans and there was much talk about the emergence of PET for functional imaging of cancer**.** Richard Wahl of Johns Hopkins Medical Institute gave many examples of how PET and PET/CT approaches have evolved; indicating that, for some cancer sites, PET is becoming a new standard of care**.**

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ASTRO…. (Continued from page 9)
Panel presentations touched upon many current radiation topics including: "Prostate Hypofractionation – Progress or Peril", "Optimization in Radiation Planning and Delivery: Myth or Reality?" and "Treatment Margins, A New Mantra in Radiotherapy". These sessions were designed around the experience of international leaders in the field who had specific objectives to cover. Perhaps a sign of the advancement of basic science into the clinical realm were two panel sessions dealing with clinical aspects of molecular biology.

I found the poster sessions especially appealing. Here you really have a chance to find yourself engaged in a meaningful discussion with other RO professionals and it gives you a chance to meet the author and get the real scoop (and perhaps a cover image for the next InterACTIONS). Poster sessions provide an opportunity to talk as peers and catch the excitement from the author, first hand.

It is interesting to see the link between what is being talked about by scientists and physicians in the various sessions and what products are being offered by the vendors. A case in point is image-guided radiation therapy. All the major linac vendors now offer some sort of kilovoltage or megavoltage imaging technique, either in fix-gantry fluoroscopic mode or cone-beam CT. I was surprised to see that Seimens has introducing a new linac sporting a 160-leaf MLC with a 20 cm leaf travel and kV and MV imaging capabilities – the leapfrog continues. Be careful to check for the asterisk (*research only) on all product literature before you send in your PO. I think I was most impressed to see that TomoTherapy has finally come into its own and is now a true commercial product with a rapidly growing customer base (17 and growing - last count). There was much activity at their booth as they demonstrated mock tomotherapy treatments and displayed posters of various customer clinical applications (even a cranio-spinal irradiation – my gosh).

The ASTRO Appreciation Reception was held on Tuesday night out at Turner field, the home of the Braves. Even though the park is not on the original site, it seemed to have the feel of an old-time ballpark but with modern entertainment facilities. All in all I thought the 46th annual ASTRO meeting in Atlanta was very well organized, enlightening and fun. I would recommend the meeting to all medical physicists who are looking to better understand the current and future trends in therapeutic radiology and oncology.

Report on EPI 2004

Submitted by Richard Lee
Vancouver Cancer Centre, Vancouver, BC

The 8th international workshop on electronic portal imaging (EPI) was held last year from 29 June – 1 July 2004 in Brighton, UK. The workshop is held once every 2 years and always provides a diverse collection of talks from therapists, oncologists and physicists from Europe, North America and as far as Australia.

This year the accommodation, as well as the conference itself, was held on the campus of the University of Sussex, much to the chagrin of anyone who attempted to access their e-mail. (The campus IT department seems to take network security very seriously.) On the bright side, everyone who attended received a free t-shirt and a nifty umbrella. (It was so nice that I gave mine to airport security on my flight out).

In the conference proper, there were two main areas under discussion. First the traditional: the clinical use of a portal imager for verification. This year the use of fiducial markers featured quite predominately and several of the presentations were given on inter and intra-fraction motion as well as margin reduction. The second theme revolved around new technologies --- using a portal imager for exit dosimetry, cone beam CT and IMRT QA were among the topics presented.

After conference hours, Eleckta sponsored trip to the Royal Pavilion (built for King George IV) where many of us took a guided tour and indulged in a gourmet banquet. In addition, Brighton itself had many famous attractions and the conference dinner was held at Brighton Race Course. As a race course, TV screens were strategically positioned around the room and the speeches this year were cut short in favour of the European cup (UEFA) soccer matches.

Amongst the revelry some serious work was accomplished. Shlomo Shalev, one of the original physicists who first organized the workshop, announced that he will retire from scientific committee but not before assisting in the selection of the site for the next meeting: Melbourne Australia.

Results of the 2004 CAMPEP Questionnaire

Submitted by Brenda Clark,
Vancouver Cancer Centre, Vancouver, BC

In March 2004, CAMPEP circulated a questionnaire eliciting input from the general medical physics community on CAMPEP accreditation processes for graduate and residency programs. The accreditation of continuing education programs was not addressed in this questionnaire.

By 10 June 2004, we had received 160 responses from individuals working at approximately 125 different institutions, 60 and 49 from individuals in institutions offering graduate and residency programs respectively. Of the responses from individuals working in institutions with established programs, approximately 35% were accredited by CAMPEP. This level of response and the overwhelmingly positive input indicates a strong level of support for CAMPEP activities which is encouraging.

The appendix gives the numerical response to the eight questions asked in the survey, from which it can be seen that in general, the perception among the respondents is that CAMPEP accreditation is seen as a positive and worthwhile endeavour. Many of the respondents took the trouble to add comments and, although space does not permit publication of individual comments, a summary is given here.

The comments can be grouped into several issues and in many cases similar ideas were expressed by several respondents. The main issues raised were: the perceived relevance of accreditation, the flexibility of CAMPEP accreditation and CAMPEP's application process.

Perceived Relevance

This group of comments contained responses indicating that many members of the community are unaware of the relevance and value of accreditation. It was also stated that as accreditation is not yet recognized by board certification bodies or licensing agencies, it is difficult and sometimes impossible to obtain institutional support for accreditation activities.

Accreditation should be seen as a public recognition that an educational program has met national standards and also as a tool to ensure that education programs enable their students to be competent practitioners. To date, accreditation has been widely embraced in the medical field and most of us work in facilities that are accredited by the appropriate body. However, accreditation is not yet seen as relevant in some other educational areas, illustrated by the fact that few universities or university programs are accredited.

These comments have clearly identified the need to raise awareness within the community and the members of the CAMPEP board have agreed on several courses of action. Among these, the website will be revised to be more informative, program graduates will be sought to write articles for publication describing personal experiences with accredited programs, data on relative performance of graduates in certification examinations will be sought, and a symposium on accreditation is planned for next year's annual meeting(s).

Flexibility of CAMPEP Accreditation

This group of comments highlighted the perception that achieving accreditation relies on conforming to a pre-determined set of criteria with little flexibility. There were also several questions concerning the requirement that graduate programs have a minimum of 8 students.

The Board's response to this issue is threefold. Firstly, the accreditation application guidelines posted on the website describe a typical program and do not represent a rigid requirement. The program review committee members are flexible on various aspects of program structure and content. The aim is to achieve a certain standard for the students in the program and there is recognition that there could be many different approaches which achieve the same result. The two program review committees have been asked to review the wording of the guidelines to emphasise this flexibility.

Secondly, CAMPEP's Graduate Education Program Review Committee (GEPRC) was asked to review the requirement relating to program size. The response from the GEPRC is that although the guidelines recommend that a minimum of 8 students are enrolled in the program, in practice accreditation has not been denied on the basis of low student numbers alone. There is no such limitation in the requirement for residency training programs.

Thirdly, it should be pointed out that CAMPEP has accredited programs having a focus and greater strength in either imaging or therapy. While it is recognized that medical physicists require a basic knowledge in both areas, it is not always feasible for a centre to offer students comparable depth in both topics.

The Application Process

Feedback on this topic reflected the concern around the documentation, resources and administrative support required for accreditation application. CAMPEP has recently moved to a template-based application which should serve to standardize the application format (but not the programs!). Not only will this assist the program directors making the application, but will also greatly streamline the review process. Efforts will also be made to emphasize the value of the self-study required by the application and to recommend that this document be kept up to date. This practice will facilitate regular program review and greatly reduce the effort required to apply for re-accreditation.

Summary

Since it's formation in 1995, CAMPEP has grown and developed with the needs of the community to the level where now we estimate that more than half of all medical physics

(Continued on page 12)

CAMPEP Questionnaire…. (Continued from page 11)

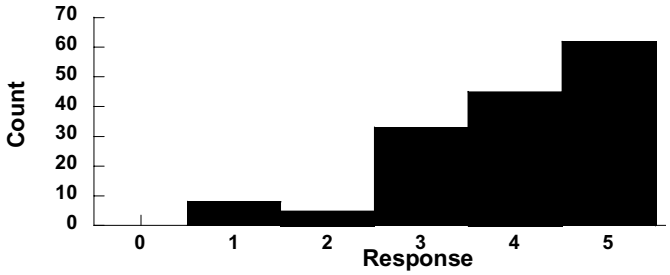
graduate students attend an accredited program. Accreditation of residency training is also on an upward trend. The strength and value of CAMPEP accreditation is best evaluated by the response of our clients, the students. This response has in recent years been clearly in support of accreditation, with those programs achieving and maintaining accreditation being clearly favored by the student applicants. The input from this questionnaire will be used by the CAMPEP Board and committee members to maximize relevance of our activities and to ensure continuing credibility of our processes. Above all, the objective is to accredit programs in which the student can expect to have a comprehensive quality educational experience in medical physics, with the emphasis on quality.

Brenda Clark, on behalf of the CAMPEP Board

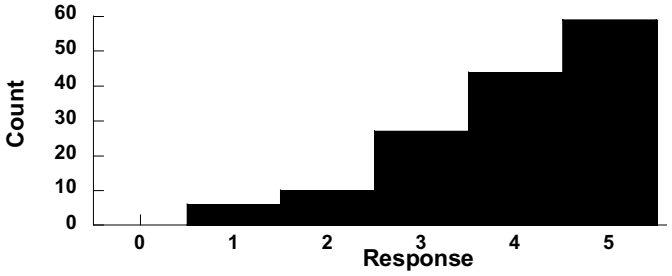
APPENDIX

Key: Strongly Disagree = 1 Strongly Agree = 5

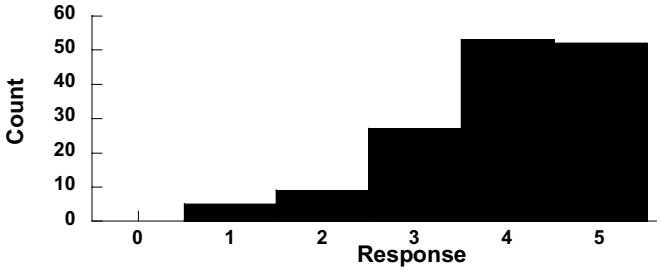
1 If I had an opening for a staff physicist, all other things being equal, I would hire a physicist who had completed a CAMPEP accredited residency program.



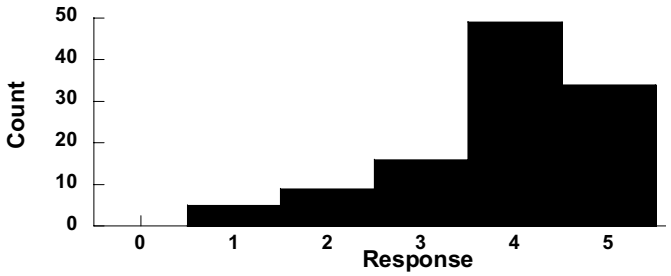
2 If I had an opening for a resident in radiation oncology physics, all other things being equal, I would hire a physics graduate from a CAMPEP accredited program.



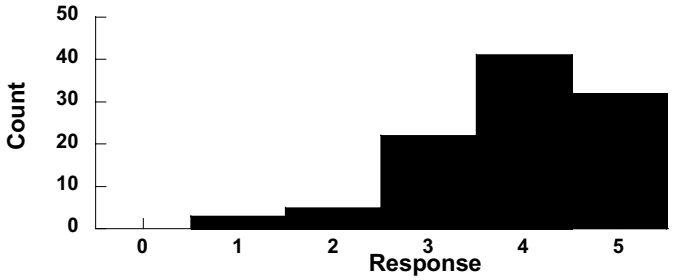
3 CAMPEP accreditation provides a meaningful confirmation that the educational program functions at an acceptable standard.



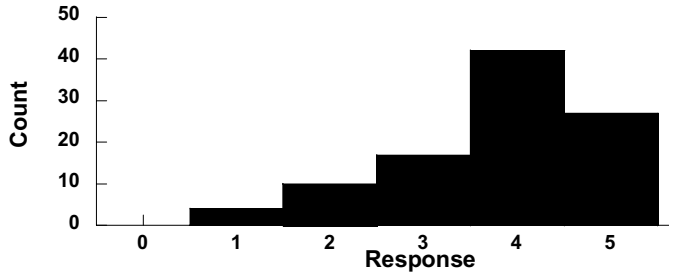
4 The CAMPEP requirements for accreditation are reasonable.



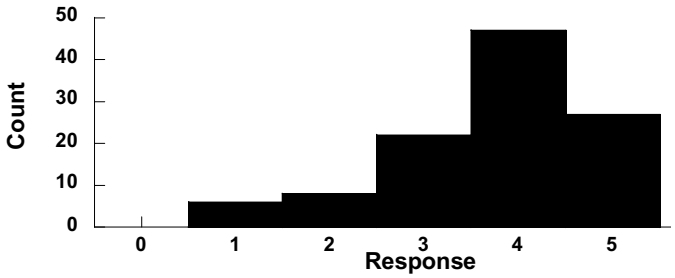
5 The CAMPEP requirements and guidelines for accreditation are clear.



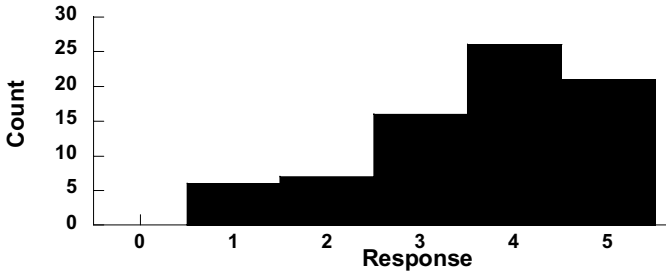
6 The teaching resources required to run a CAMPEP accredited program are reasonable.



7 The effort required to apply for CAMPEP accreditation is justified.



8 CAMPEP offers support and encouragement to institutions considering applying for accreditation.



Across Canada

I would like to thank the participants in this issues "Across Canada" column: Peter Dunscombe, Wayne Beckham, and Peter Raaphorst. Due to some missing text in the last issue submission from Jake Van Dyke (editors fault!), I have reprinted his contribution here in it's entirety.

London Regional Cancer Program
LONDON HEALTH SCIENCES CENTRE

A Cancer Care Ontario Partner

London Regional Cancer Program, London, ON
Submitted by Jake Van Dyke

As of 1 January 2004, the London Regional Cancer Centre, like all the other clinics of Cancer Care Ontario, was integrated with its host hospital, the London Health Sciences Centre. Our new name is the London Regional Cancer Program (LRCP), London Health Sciences Centre although we remain "A Cancer Care Ontario Partner". Instead of being paid by Cancer Care Ontario, we are now all employees of the London Health Sciences Centre.

During the last week of March we took possession of over 6 million dollars worth of radiation equipment. This included 2 new Varian 21EX fully loaded linear accelerators, 3 new amorphous silicon portal imagers as upgrades for existing accelerators, a new Varian HDR brachytherapy system, new operating room imaging/fluoroscopy system, and a new Varis software upgrade. All of this, except for one accelerator, is now in clinical use. Kudos to the physics staff for making this happen in a very expeditious manner!

On 19 April 2004, Eugene Wong along with Jeff Chen, Glenn Bauman, Tomas Kron, Jerry Battista, Henning Rasmussen, Jake Van Dyk, were informed that they succeeded in acquiring $214,300 over 3 years for a research grant from the National Cancer Institute of Canada entitled *Intensity Modulated Arc Therapy for Radiation Treatment of Cancer*.

The following LRCP related awards were announced in Winnipeg at the COMP annual meeting banquet in June:

1. Kathleen Surrey won first place in the Young Investigators' Symposium. Kathleen at that time was a Ph.D. student at the Robarts Research Institute but has joined us as a Medical Physics Resident as of 21 June 2004. The title for Kathleen's presentation was *Three Dimensional Ultrasound and Stereotactic Mammography Guided Biopsy: A Dual Modality System*. Co-authors: Kathleen Surry, Greg Mills, Donal Downey, Aaron Fenster.
2. William Song placed third in the Young Investigators' Symposium. For a first year Ph.D. student, this is quite a feat! The title for William's presentation was *Limitations of a Convolution Method for Modeling Geometric Uncertainties in Radiotherapy: The Biologic Dose-Per-Fraction Effect.* Co-authors: William Song, Jerry Battista, Jake Van Dyk.
3. Mike Oliver won the best poster award. His poster was a "real eye catcher". The title of his poster was *A Dosimetric Comparison of Four External Beam Techniques for Accelerated Partial Breast Irradiation: Setup of Study and Preliminary Results*. Co-authors: Mike Oliver, Jeff Chen, Eugene Wong, Tomas Kron, Jake Van Dyk, Francisco Perera.

At the end of June, we were informed that Jake Van Dyk, Jerry Battista, and Glenn Bauman succeeded in getting a 5-year CIHR grant for a total of $606,599 for research entitled *Optimization of Radiation Therapy: Uncertainty Analysis and Strategies for Improvement.*

Congratulations are in order to Jerry Battista who became the new Chair of the Department of Medical Biophysics at University of Western Ontario. Now he only spends half of his time at the cancer centre with the other half devoted to university issues. Good luck, Jerry, in this new venture!

In August we performed our first megavoltage CT scan on a patient with our new Tomotherapy machine and on 2 Sept 2004, we performed our first Tomotherapy clinical treatment. All systems are now geared up for increased clinical activity on this new adaptive treatment modality. Hats off to the leadership provided by Tomas Kron for making this happen! In the meantime we have also treated more than 60 patients (>1400 fractions) with intensity modulated arc therapy (IMAT) on conventional linacs. In this context, we have also started a hypofractionated prostate cancer protocol using IMAT with ultrasound guidance for patient set-up.

Our new graduate students arrived early in September and we now have a total of nine in radiation oncology related medical physics.

This only highlights some of the activities at the LRCP as of the beginning of 2004. It is clear that Medical Physics is alive, active, exciting and productive at the London Regional Cancer Program!

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ACROSS CANADA… (Continued from page 13)

Ottawa Regional Cancer Centre/Carleton University, Ottawa, ON
Submitted by Peter Raaphorst

The last 3 years have been significant in terms of change and growth at the Ottawa Regional Cancer Center, now called The Ottawa Hospital Regional Cancer Center. In radiotherapy the number of patients treated has increased from 3000 to 4100 in a period of 3 years. In addition, the RCC has developed a number of specialized techniques in radiotherapy, which include an advanced program in Brachytherapy, as well as Stereotactic Radiotherapy and Total Body Irradiation. Further development on specialized treatment techniques is continuing.

The Physics Department, headed by Peter Raaphorst, is comprised of 12 Physicists who are: Lee Gerig, Joanna Cygler, Janos Szanto, David Wilkins, Gabriel Lam, Miller MacPherson, Ian Cameron, Chun-Bun Kwok, Abdelhamid Saoudi, Elizabeth Henderson, and Balazs Nyiri. This staff engenders strong knowledge and experience in specialization areas which include, radiotherapy physics and planning, PET and PET-CT imaging, MRI imaging, computer data management and transfer, radiation safety and is poised for current and future growth at the Regional Cancer Centre. Current activities include: the clinical implementation of Monte Carlo treatment planning, the utilization of MRI imaging in planning of radiotherapy patients, the application of in-vivo MOSFET based dosimetry, the clinical research and development of radiation gating strategies, the installation and integration of a multi-portal data access management system, to name a few.

The Regional Cancer Centre is further poised for significant changes in the year 2005. During this year a new multi-slice CT Simulator installation will be completed, and will be integrated in to treatment planning and preparation. In addition, a PET-CT is being installed at the Regional Cancer Centre and should be commissioned by the beginning of 2005. This unit is dedicated to oncology and will contribute to precision planning and treatment of cancer patients, especially considering the approach of functional imaging for the development of biological treatment plans. In addition, in the year 2005 four old linear accelerators will be replaced with new state-of-the-art radiotherapy units. These will include 3 new linear accelerators with capability of performing precision IMRT, and in addition a Tomotherapy unit for image-guided intensity modulated radiotherapy. It is the objective to use then the PET-CT in conjunction with the Tomotherapy unit to allow image-guided precision intensity modulated radiotherapy based on both radiological and functional imaging. In addition, the selection process has also started for a new state-of-the-art treatment planning system to support the new modalities in radiation therapy and imaging, Thus the Physicists of the Regional Cancer Centre will be enjoying a very busy year in the year 2005.

There is also extensive activity on the research and academic fronts. The Physicists of the Regional Cancer Centre are appointed to the University of Ottawa Department of Radiology, as well as some to the Department of Cellular and Molecular Medicine. In addition, the Physicists are appointed to the Physics Department of Carleton University, and comprise a significant component of the Ottawa Medical Physics Institute (OMPI). This Medical Physics Institute, based at Carleton University Physics Department, comprises 28 Physicists and has regularly between 15 and 20 graduate students. The program offers a full syllabus of courses in Medical Physics and Degrees at the Masters and Ph.D. level. Last year the Regional Cancer Centre Physicists supervised 8 graduate students. The graduate students of the program regularly win prizes for presentations at scientific meetings, win travel awards to attend scientific meetings, and are supported by scholarships from funding organizations. In addition, the Regional Cancer Centre also has 4 Resident positions, and the Physicists of the Regional Cancer Centre participate in teaching courses at the graduate level at Carleton University Physics Department. The graduate students and residents play and important role in contributing to new research activities of the Cancer Centre Physics Program.

Research activities involve a number of areas. These include dosimetric research, development in brachytherapy, magnetic resonance imaging research, radiobiology, development of functional imaging on PET CT to use in biological treatment planning, modelling of radiobiological applications in clinical radiotherapy, and currently a substantial amount of activity is directed at developing protocols and research directions for both Tomotherapy and PET CT in the new precision approaches to clinical cancer treatment. Research has been supported by grants from the National Cancer Institute of Canada, the National Institute of Health of the US, NSERC, CIHR, as well as support from collaboration with industry which bring in a substantial amount of money from radiotherapy equipment companies as well as support from drug companies for drug multi-modality approaches in radiotherapy.

The year 2004 has also been a year of tremendous change in the organization of the Ottawa Regional Cancer Centre. In the beginning of the year the Cancer Centre integrated with the host hospital. This integration meant that the employees of the Cancer Centre are now employees of The Ottawa Hospital. The integration process posed a number of challenges as to how the Cancer Centre staff would fit into the hospital environment. Many of these challenges have now been overcome and the Programs are moving forward in an organized manner. The Physicists activities remain the same in terms of supporting the radiation treatment program and their academic activities at the Universities. The integration with the host hospital also allows a closer interaction of the Medical Physicists of the Cancer Centre with a number of the Medical Physicists of the host hospital, and further discussions will take place on how these interactions and this type of integration will develop in the future. Thus, the year 2004 has been an extremely busy year, and has resulted in culmination of a large number of activities including integration, and the year 2005 will pose substantial challenges in terms of integration of new equipment into the radiotherapy program and the way cancer therapy is done at the Ottawa Hospital Regional Cancer Centre.

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ACROSS CANADA… (Continued from page 14)

Tom Baker Cancer Centre/University of Calgary, Calgary, AB
Submitted by Peter Dunscombe

The Tom Baker Cancer Centre provides radiation treatment services for southern Alberta with a population base of 1.5 million. 2900 courses are delivered annually on the Centre's eight accelerators and one Cobalt unit, with these treatment units being supported by two CT simulators, one conventional simulator and the Pinnacle® treatment planning system. HDR and LDR brachytherapy equipment is also available and used almost exclusively for gynecological treatments.

In 2003, the Nucletron seedSelectron was introduced for prostate brachytherapy. To date 70 patients have been treated on this system – the first in clinical use in Canada. In November 2004, the stereotactic program was moved from a conventional linac to a newly installed Novalis system – also the first in Canada. This facility includes a micromultileaf collimator (3mm wide leaves at the isocentre) and a three dimensional x-ray verification and positioning system. It can be used for extracranial SRS/T and 4D radiation therapy as well as the more usual intracranial irradiations for a variety of malignant and non-malignant conditions.

The treatment of patients and the introduction of new techniques are supported by the Department of Medical Physics with 40 FTE staff. There are ten scientific staff positions including one resident position; approximately 20 treatment preparation/ planning staff as well as well staffed and equipped electronics and mechanical shops.

Courses of study leading to M.Sc. and Ph.D. degrees through the Department of Physics and Astronomy at the University of Calgary are offered. Four graduate students are currently enrolled in the Radiation Oncology Physics Specialization.

Members of the Department are also active in educational programs for Radiation Oncology and Radiation Oncology Physics Residents and Radiation Therapists.

Research is largely clustered around clinical programs with a high degree of collaboration with the Department of Radiation Oncology. Currently, the research areas of interest are prostate brachytherapy, SRS/T, precision radiation therapy for external beam prostate and head and neck treatments and probabilistic risk analysis.

For more details of the academic activities of the Department you might like to visit: tbccmedphys.ca

Vancouver Island Cancer Centre/University of Victoria, Victoria, BC
Submitted by Wayne Beckham

The Vancouver Island clinic's medical physics group continues in its development since its "rebirth" following our move to the new cancer clinic in March 2001. With the new centre came an increase in staffing so we now have 7 physicists and 2 residents as well as state-of-the-art treatment equipment.

A variety of research concerning implementation and assessment of new technology is ongoing. Derek Wells is leading our team that is investigating the use of our Varian RPM respiratory gating system. Our resident, Isabelle Gagné, ably assists him. Our first patient treatment using this system was in November.

Will Ansbacher has successfully lead the development of the physics aspects of an HDR partial breast treatment technique, which has so far treated about 22 patients. This technique delivers treatment over 9 fractions in 1 week.

We have a busy IMRT program in head & neck treating 1 – 2 patients per week. Our other resident Fred Cao has been busy developing a routine process for clinical QA. We are investigating application to other sites including CNS & breast. Our inverse-planned multi-field breast technique development is being performed largely by Carmen Popescu with the assistance of a radiation therapist who is doing some of the standard comparison plans.

We are beginning the process of prostate seed implant planning. Having recently acquired the Variseed treatment planning software, Yen Pham will be working closely with our Vancouver Clinic colleagues to draw on their vast experience with prostate seed implants and bring a technique we can implement in Victoria.

Sergei Zavgorodni is presently leading our project that is the result of several years of development involving many physicist staff (including Tony Popescu who is now a physicist in the Vancouver Clinic) and University of Victoria student hours to perform Monte-Carlo verification of our clinical IMRT treatment plans. We can now calculate a clinical 7-field IMRT dose distribution using patient CT data, and a cylindrical QA phantom in about 15 hours.

Michelle Hilts has just joined us on staff in Victoria. She took time out from her duties at the Vancouver Clinic (where she was an MCCPM certified medical physicist) to pursue a PhD degree. She has almost concluded her thesis and will be full time with us early in the New Year.

We are also very lucky to have Andrew Jirasek who spends about 50% of his time in the clinic. Andrew is a faculty member of the Physics & Astronomy Department of the University of Victoria. He is pursuing research in the clinic concerning

(Continued on page 32)

Radiation Safety and Stereotactic Radiosurgery: The Leksell Gamma Knife ®

By Harry M. Johnson,
Radiation Protection Services,
CancerCare Manitoba, Winnipeg, MB

Introduction

It seems to be going against the trend in radiotherapy. At a time when many Radiotherapy departments are decommissioning their cobalt-60 units, Neurosurgery departments are discovering cobalt radiation for stereotactical radiosurgery. Such is the case in Winnipeg. Following a determined effort to rebuild Neuorsurgery, the Winnipeg Regional Health Authority (WRHA) and the University of Manitoba's department of Neurosurgery were successful in obtaining funding for the Leksell Gamma Knife ® and the expert clinical team. The first Canadian installation was completed in the summer of 2003. Patient treatments began in November 2003. Clinical operating experience is highly successful.

The acquisition and licensing of the Gamma Knife ® also involved the support of CancerCare Manitoba (CCMB) and the commitment for participation by oncologists, medical physicists, electronics specialists and Radiation Protection Services. The discussion that follows describes the radiation safety support.

In stereotactic radiosurgery, a method of target orientation by means of a steroetactic rig is used while external radiation beams are precisely directed towards cranial lesions that are otherwise not amenable to conventional surgical techniques. The Gamma Knife ® is one such tool. It is the development of a Swedish team led by Dr. Lars Leksell who commissioned their first unit in Stockholm in 1968. Dr Leksell had reasoned that if stereotactic needle electrode insertion into the brain was practical it should be possible to direct radiation in a very precise manner at a cranial target for the destruction of localized tissue. This is the principle of the tool. The first US installation was completed in 1987 (Maitz, 2000). The Winnipeg installation is the first of its kind in Canada. The technique is widely recognized as effective for the treatment of certain brain neoplasms and for arteriovenous malformations in appropriately chosen patients.

The Gamma Knife ® principle is illustrated in Figure 1. It consists of a massive, self-shielding ball head in which are located 201 cobalt-60 sources. Calibrated sources are placed in numbered channels, 'focussed' by collimation tubes onto a common radiation centre. The radiation centre is contained within the ball head and is accessible through shielding doors that open under remote control. Once opened, the doors permit entry of the patient whose head is held rigidly in a stereotactic frame. The frame is held within one of a number of 'helmets', selected according to the size of their collimating channels. Remotely controlled motors permit the treatment computer to align the target lesion with radiation centre. Treatment is determined from MRI or CT scans imported into the treatment-planning computer on the day of treatment.

COMP members are well aware that while this radiosurgery tool was a Swedish development, the basis for cobalt-60 irradiation is something for which Canada takes credit. Indeed, the source of supply for the cobalt-60 pellets for the radiosurgical tool is Canadian.

Each of the 201 cobalt-60 sources had an initial activity of approximately 1.2 TBq giving a total source activity of 240TBq at the time of installation.

Facility Design

Workload

Workload, the direction of radiation and radiation energy are principle design requirements for a shielded facility. Elekta, the

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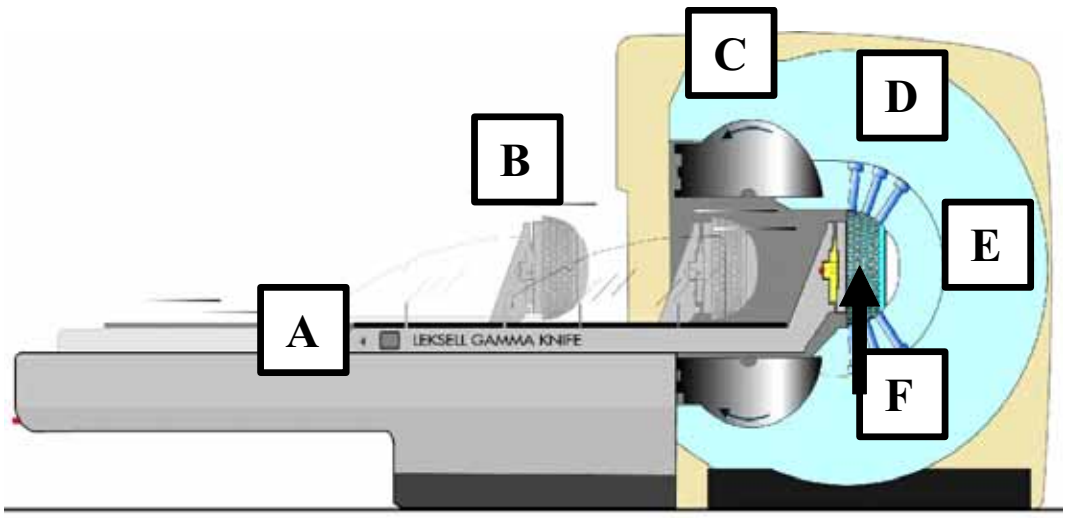

Figure 1: Schematic of the Leksell Gamma Knife ®, supplied by the vending company Elekta. Showing the following features: A – patient couch; B – Helmet in successive positions as patient enters chamber, C – rotating shielding doors; D – sources and collimator tubes; E- shielding; F – arrow points to radiation centre.

Radiation Safety... (Continued from page 16)

vendor company for the Leksell Gamma Knife ®, provided radiation dose rate profiles within a treatment room at levels from floor level to a height of 2 m. in grids of 0.5 or 1.0 m. for design of exterior walls and ceiling.

Radiation Field Distribution

The schematic design of the Gamma Knife ® given in Figure 1 illustrates the source location and the shielding design. The alignment of collimators for each source to a central focus within the self-shielding of the ball head is such that all beams are intercepted by the shielding. Only radiation that has been scattered at least once can exit the radiation unit when the shielding doors are opened. The radiation field distribution is such that the maximum beam is obtained in an arc subtended by an angle of 70 degrees centred at the open shielding doors and symmetrical about the centre line of the device (the couch direction). The maximum dose equivalent of 4.6 mSv/h is observed along the centre line at a distance of 1.7 m from the open doors. At 4.5 m along this centre line the field has dropped to less than 0.1 mSv/h. The radiation level is 0.4 mSv/h at the end of the couch dropping to 0.16 mSv/h at 5.5 m from the open doors.

On the other hand, a radiation "shadow" region exists in the treatment room beyond an angle of 140 degrees, symmetrical about the central axis and centred at the open shielding doors. Dose equivalent rates are less than 50 microsieverts per hour in this region. To the rear of the unit, along a line perpendicular to the central axis and 1 m. behind the ball head shielding, the dose equivalent rate is less than 10 microsieverts per hour. The shadow region is important for the positioning of emergency stop buttons as well as for the design of facility shielding.

Critical radiation fields for specific locations in the Winnipeg facility are shown in Table 1, associated with the facility layout given in Figure 2. At radiation centre, the initial dose rate was approximately 3.7 Gy/min (220Gy/h).

Understanding the method of patient treatment is important to the design of the facility. The precision by which the target can be localized is of the order of 0.2-0.5 mm. The patient is positioned within the open irradiator for a time determined by the dose to be delivered, the size of the focus as achieved by helmet collimator diameter, and the dimensions and shape of the lesion. Several irradiation "shots" occur at locations within the

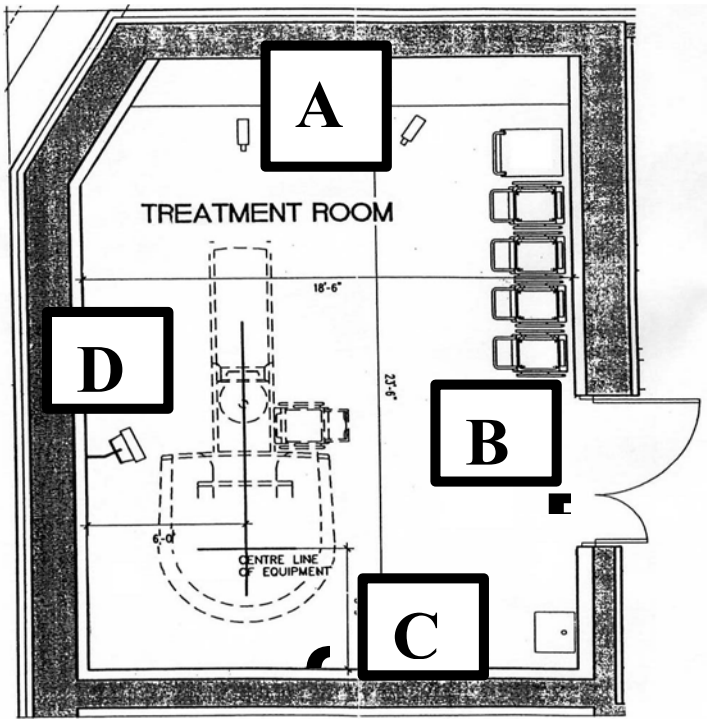

Figure 2: Layout of the Winnipeg treatment room.. The Gamma Knife ® is shown in dotted lines, helmet rack is along the right wall above the doorway. Locations are shown for critical radiation levels, unshielded: A – 200 μSv/h; B - 50 μSv/h; C - 10 μSv/h; D - 640 μSv/h.

scope of the motor drives during a single entry of the patient into the irradiation chamber. The patient may be withdrawn from the chamber, shielding doors closed, patient re-positioned and then re-inserted into the chamber for a new series of "shots". Each transit of the couch and opening/closing of the shielding doors takes a finite time that must be accounted for as part of the workload. Hence in assessing the workload for shielding requirements, the average patient irradiation time, the number of "runs" to transport the patient on the couch, the time for shielding doors to open or close and the time for couch transit must be determined. The projected number of patients per annum must be known and, finally, the beam time for quality assurance must be estimated. The initial choices of these parameters were based on the experience of the clinical team and the advice of the vendor.

Facility shielding has been conservatively designed. ALARA

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Location	Material	Thickness	Occupancy Nature and Occupancy Factor
North Wall	Concrete	35 cm.	Public, 1
East Wall	Concrete	50 cm.	Public, 1/16
South Wall	Concrete	45 cm.	Public, 1/16
West Wall	Concrete	55 cm.	Occupational, 1
Door	Lead	1.3 cm	Occupational, 1/4
Ceiling	Concrete	50 cm.	Public, 1/16
TVL	Concrete	20.6 cm.	
TVL	Lead	4.0 cm.	

Table 1: Construction materials and relevant shielding design data for the Winnipeg facility

Radiation Safety... (Continued from page 17)

targets of 500 μSv per annum were chosen for occupationally occupied areas and 50 μSv per annum for areas occupied by members of the public at the exterior of the treatment room. Measured unshielded dose equivalent rates at these interior locations are given in the caption of Figure 2.

The facility was constructed with materials described in Table 1. The table also provides data for tenth-value layers (TVL) of ordinary concrete (density 2350 kg/m^3) and lead, applicable to the cobalt energies, as well as the nature of the occupancy at the several exterior locations and the assumed occupancy factors.

The facility was purpose-built, on grade, with access to the street. This was important for the installation plan. Floor loading is a major safety consideration in this facility. The loading is maximized at the time of source installation when the Gamma Knife ®, the shielded loading cell and the source shipment flask are brought together. The vendor advised that the total mass of these units would be 38.5 tonne and the floor of the intake way must be capable of a loading of 20 tonne per square metre.

Licensing Documentation:

CNSC licensing of the facility followed licensing guide C-120 (CNSC-1). The initial licence to construct was followed by a licence to commission. Once commissioning data were obtained, application was made to amend the licence for clinical operation. The licence to construct included a facility design review manual. One lesson learned in subsequent interactions is the contemporary need to address the security of large sources with more deliberation. Security needs are discussed later in this paper. Two "designated supervising physicians" were assigned to this facility, a neurosurgeon and a radiation oncologist. This was a new facility for CNSC licensing. A video from the vendor describing the installation was provided to the licensing officers and they visited during installation, taking their own radiation field measurements.

Installation

Coordination for the installation was accomplished between the WRHA planning department and the installation contractor, Alpha-Omega Services Inc. On the day of installation, Alpha-Omega staff, a local rigging crew and transport drivers brought together the ball head, the loading cell and the source shipment. A 'tailgate' radiation safety huddle was held with the rigging crew and their electronic personal dosimeters assigned. Images of the arrival of the ball head and of the loading cell are shown in figures 3 and 4.

The installers supervised the placement of the ball head, the loading cell and the source flask. They transferred, and verified the location of, each of the 201 calibrated cobalt sources according to a predetermined loading plan. The installers were separately licensed by the CNSC for their work, brought their own dosimeters and performed wipe tests and radiation field tests in conjunction with the formalities for the transfer of source ownership.

Figure 3: The Gamma Knife ® at time of delivery.

Figure 4: Image of the loading cell that mates the ball head with the shipping flask for cobalt source transfers.

The radiation safety officer's plan included a dose budget of 300 microsieverts for the rigging crew. The maximum individual dose equivalent received by one rigger was 19 μSv, others were in the range of 3 – 5 μSv. The riggers' doses were mainly received during the removal of over pack bolts for the source shipping flask.

Final wipe testing, signage for the newly loaded Gamma Knife® and identifying the source shipping flask as empty were the last stages of the installation-day procedures.

(Continued on page 19)

Radiation Safety... (Continued from page 18)

Radiation safety work during installation day consisted of the following:

- tailgate safety training for local rigging crew;
- assignment of personal electronic dosimeters to riggers;
- wipe testing, radiation field measurements and transport index confirmation of source flask on arrival;
- monitoring riggers while removing source flask shipping over pack, taking flask into the facility and during source transfer;
- sign-off of ownership transfer of the sources;
- wipe tests following source installation and the separation of the source flask from the loading cell and the loading cell from the ball head;
- Signage, licence posting for the active facility and for the empty flask.

Commissioning Tests

Dose rate measurements were made around the perimeter of the ball head before the decorative covering was in place and prior to the opening of the shielding doors. The measurements were performed on-contact and at 1 m from the sources. The on-contact dose equivalent rates ranged from 0.8 to 62 microsieverts per hour, the highest reading being found in the lower region of the shielding doors. There is no licensing specification for the on-contact radiation levels. However, the licence does require that radiation levels at 1.0 m. from the sources must not exceed 20 μSv/h. Measurements at 1 m. for the newly installed Gamma Knife® ranged from 0.7 to 11.6 μSv/h, the highest reading also being at the lower region of the shielding doors.

All interlocks and the video monitoring system were checked prior to "first beam".

Dose equivalent rates at the external walls of the treatment room, with the shielding doors open, ranged from background (0.1 μSv/h) to 0.45 μSv/h. Calculated annual doses at all external locations were below the design targets.

Radiation Safety Program

The radiation protection program is designed according to the approach of the Protection Equation:

Protection = Prevention + Detection&Assessment + Response

The major emphasis is placed on preventive measures, including administrative procedures, training and physical barriers. Detection and Assessment stages are supplied by interlocks, instrumentation and personal dosimetry. The emergency plan is developed in the event that action by the response team is required. Medical physics members are responsible for the emergency response plan and its training. Radiation measurements and time and motion studies were conducted to evaluate the potential personal doses to clinical and medical physics staff during patient removal. These factors are discussed later.

The Gamma Knife organization is such that the primary responsibility for safety is assigned to the CEO of the WRHA. The oversight of this responsibility is delegated to the COO of the Health Sciences Centre, then to the Medical Director of Neurosurgery. From there the safety assignments cascade to the clinical team. The Radiation Safety Officer is independent of the clinical team, represents the requirements of the regulator and has access to all levels of the organization for matters of radiation safety. This is the kind of organization that is described in G-121 (CNSC-2), the publication in which the Canadian Nuclear Safety Commission provides guidance for the radiation safety program.

Policies and procedures for the facility have been developed jointly by the radiation safety officer, the clinical and the administrative teams. These policies are made known to clinical staff as part of the training process. They are part of the WRHA policy manual and as such are available on the WRHA intranet. Certain policies from the list require comment.

The clinical operation policy is such that treatment planning and beam-on responsibilities are assigned jointly to the neurosurgeon, the oncologist and the medical physicist who must be present during the treatment. Radiation therapists are not employed in this facility. Workers are not classified as Nuclear Energy Workers. The preventive measures are such that we believe that no staff will encounter annual personal doses exceeding the CNSC limit assigned to a member of the public (1.0 mSv/a). Pregnant workers are permitted to continue clinical operation without restriction. All treatment staff are assigned personal dosimeters. Personal dose projections derived from commissioning tests affirmed these choices and personal dosimetry data are reviewed to ensure that they continue to be appropriate.

Physical security of a clinical facility is an important consideration, not only for facility risk management but also for licensing. Contemporary times dictate the importance of security from the CNSC-licensing aspect because of the radiological assets that are installed. The purpose-built facility with its substantial shielding provides a robust security barrier. Nevertheless, in addition to secure doors and methods of entry control, monitoring for the presence of personnel at off-hours supplies the necessary redundancy. Another lesson learned is that, at the design stage, assessment of the CNSC security requirements is essential to prevent the need for retrofitting.

The Radiation Safety Committee for the Winnipeg Gamma Knife® facility is designed on a virtual committee model. Committee business is designed to be conducted by email. It reports to the facility director and to the chair of the WRHA Radiation Safety Council. The Council, in turns, reports to the CEO of the WRHA and to the Board of the WRHA on all matters of radiation safety, including x-ray safety.

Qualifications of the clinical staff are the responsibility of the Medical Director. Radiation safety training is mandatory. A tailored radiation safety course is delivered by the CCMB Radiation Protection Services Department.

(Continued on page 20)

Radiation Safety... (Continued from page 19)

Detection and assessment activities are provided by fixed and portable equipment. Among the fixed components are the interlocks, the last person out switch, several emergency stop buttons, the area monitor, in-suite video monitoring and finally the personal dosimetry program. Comment is required with respect to the location of the several switches.

Several emergency stop switches are required in Class II nuclear facilities in accordance with the Class II Nuclear Facility and Prescribed Equipment Regulations (paragraph 9). It is imperative that some of these are located in the lower dose regions of the irradiation field and one must be in close proximity to the exit door. The last-person-out (LPO) switch must be located at an exit point from the facility where the operator has a clear view of the interior and can determine that only the patient remains in the facility. An audible alarm in the room indicates that the LPO switch has been activated. For the Winnipeg facility, the relocating of an emergency stop button has been required on the East wall. The initial button on that wall was installed forward of the projected line between the main radiation field and the radiation-shadow region of the ball head shielding. The preferred location for this button is at least 30 cm. within the shielding-shadow region.

Area monitoring is provided by an alarming Geiger detector positioned within the radiation field that exists when the Gamma Knife® shielding doors are open. The alarm is monitored at the control console and provides a visible warning within the treatment room. This alarm is tested remotely, on a daily basis, using the field from the open shielding doors as part of the quality assurance procedures.

Personal monitoring is by means of standard personal dosimeters, supplied by a CNSC-licensed service provider. A personal dose has only been observed during one wearing period – on the dosimeter of a medical physicist. The recorded dose was just above the threshold of detection. Nil doses are being observed otherwise.

Contamination monitoring by wipe testing is performed regularly as per licence conditions. The test is performed by wiping the helmets that come into contact with the interior surface of the ball head. Wipe tests are performed by a member of the Radiation Protection Services staff and are analyzed in the accredited RPS facility. No contamination has been detected either on receipt of the sources at the time of source loading or during clinical operation.

Time and motion evaluations of patient rescue scenarios supported the development of emergency response plans by the medical physicist. Tooling is provided to detach the patient helmet from the ball head and to manually withdraw the couch. While the neurosurgeon is performing this task, the medical physicist operates a hand crank to close the shielding doors. Estimates based on measured radiation fields at the respective locations of the response staff indicate that the neurosurgeon should receive less than 0.5 mSv. and the medical physicist should receive less than 0.2 mSv. during a patient rescue.

License maintenance is the responsibility of the radiation safety officer. These activities include the assurance of personal dosimeter use, the overview of the dosimeter records, training of new staff, review of wipe test results, review of workload and the preparation of the annual compliance report.

The definition of workload requires discussion because for the Gamma Knife® it differs from that used in the licensing of accelerators of teletherapy units. Usually workload is defined as the dose at isocentre and is related to the summation of beam-on time for therapy, quality assurance and servicing. Isocentre lies external to a conventional teletherapy unit and regions of direct beam and of scattered or leakage radiation must be considered. In the case of the Gamma Knife®, the radiation centre lies within the self-shielding of the ball head and all emergent radiation has been scattered at least once. Hence workload for this facility is the specification of the total dose per annum delivered at radiation centre with the shielding doors open. The original specification of workload used at the design stage of this project has been evaluated following operational experience. Data are presented in Table 2 for the various parameters that contribute to workload and hence to the prime parameter for the non-personnel aspects of facility operation that is used for control in licensing.

Parameter	Measured Value
Patients per annum	Estimated: 600
Average dose per patient	105 Gy
Average Couch Transit Time, each direction	38 seconds
Number of Couch Transits per patient	9
Dose rate at Radiation Centre (Apr ’04)	3.7 Gy/min
Quality Assurance	50 h/annum

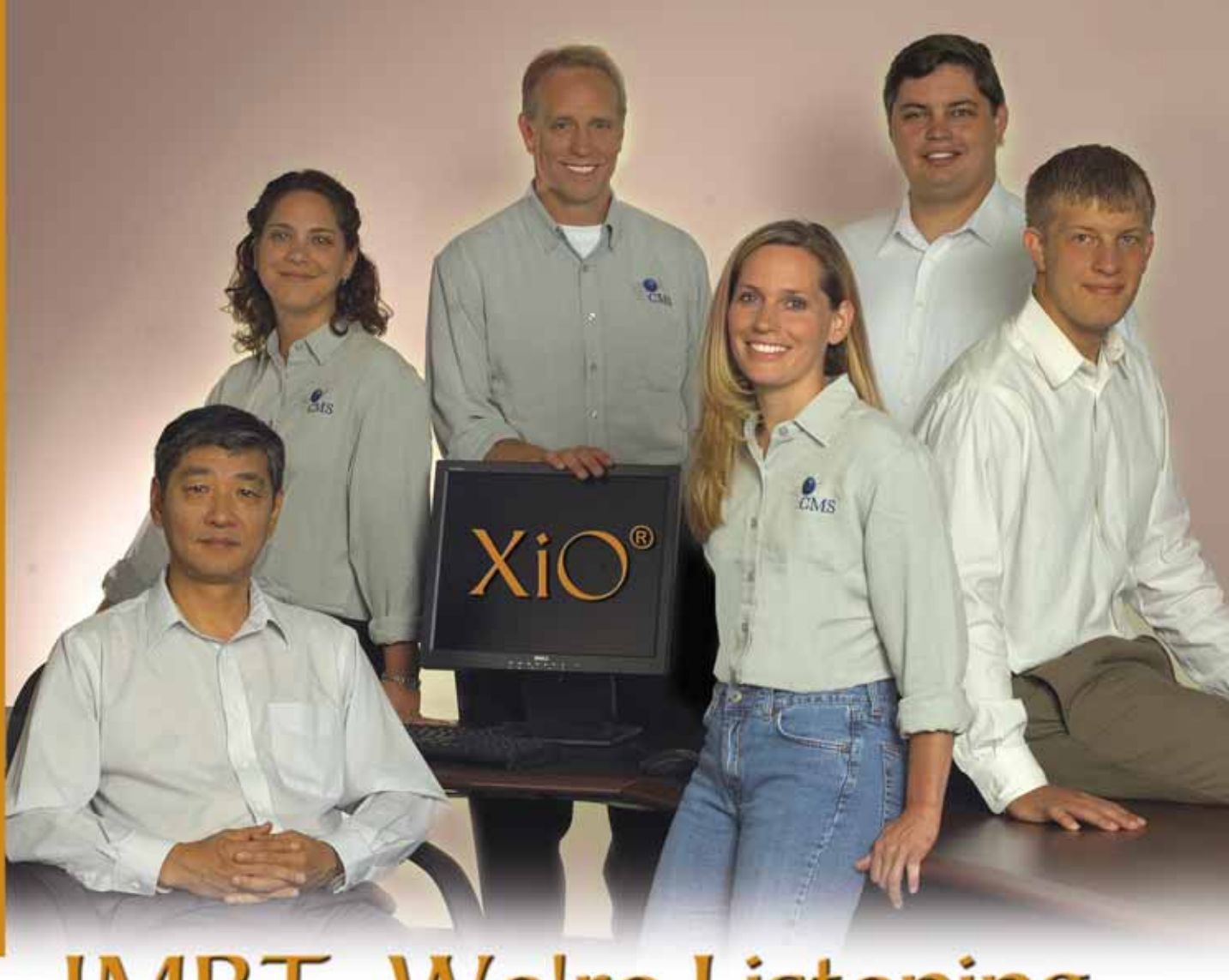
Table 2: Parameters that determine “workload” as derived from clinical experience in the Winnipeg Facility

Lessons Learned

The success of the clinical operation of the Gamma Knife in Winnipeg is a credit to the skill of the clinical team and the design of the irradiation facility. In the course of the radiation safety work, the following lessons have been learned:

- Workload is potentially greater than original data indicated;
- Conservative shielding design easily accommodates the increased workload;
- Security requirements have increased and the new security specifications must be factored into the design of facilities with large gamma sources;
- Exposure of the public-sector rigging crew during installation was a small fraction of the allotted dose budget;
- Time and motion studies and actual dose rate measurements indicate low dose to members of the response team during an emergency patient removal operation;
- Designation of clinical staff as non-Nuclear Energy Workers is supported by radiation measurements within the facility and by personal dosimetry data.

(Continued on page 22)



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Radiation Safety... (Continued from page 20)

Partnership between the clinical team and the radiation safety staff has provided a conservatively built facility that yields low staff risk and high patient benefit.

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Canadian College of Physicists in Medicine Examination Schedule 2005

Membership Examination:
Applications due: 7 January 2005
Examination date: Written 19 March 2005
Oral 28 May 2005
Fee: $450.00
Decisions announced on February 11

Fellowship Examination:
Applications due: 7 January 2005
Examination date: 1-2 days prior to COMP Meeting in Hamilton
Fee: $300.00 (in Hamilton)
Decisions announced on February 11 (or later for those who do the membership exam)

Note:

- The application forms, exam study guide, and sample exams are available on the COMP website under the heading "Certification with CCPM". Application forms must be the ones currently posted on the COMP website.
- Membership & Fellowship examination application deadlines are set to the same date. This allows the Credentials Committee to review all applications in one time period.
- **It is critical for the success of your application that you respect the deadlines**.

For further information contact the Registrar:

Dr. Wayne Beckham. Registrar, CCPM
BC Cancer Agency, Vancouver Island Centre
2410 Lee Ave.
Victoria, British Columbia, V8R 6V5
Phone: (250) 519-5620 Fax: (250) 519-2024
wbeckham@bccancer.bc.ca

Canadian Forum to Consider the Draft ICRP 2005 Recommendations

Submitted by L. John Schreiner[1], Paul Johns[2], David Wilkins[3]
[1]Kingston Regional Cancer Centre, Kingston, ON
[2]Carleton University, Ottawa, ON
[3]The Ottawa Hospital, Ottawa, ON

On Monday 1 November 2004 there was a one-day symposium in Ottawa organized by the Canadian Nuclear Safety Commission (CNSC), the Canadian Nuclear Association (CNA), the Canadian Radiation Protection Association (CRPA), and the Federal/Provincial/Territorial Committee on Radiation Protection (FPTCRP) to present and consider the draft 2005 Recommendations of the International Commission on Radiological Protection (ICRP). This will be the first comprehensive update since ICRP Report 60 in 1990. We attended on behalf of the Canadian Organization of Medical Physicists and present this brief report of the day.

The symposium was organized around two presentations to review the new recommendations by Dr. Lars-Eric Holm, the Vice Chair of the ICRP. Dr. Holm is Director-General of the Swedish Radiation Protection Authority. Various speakers from government (the FPTRPC), regulators (the CNSC), and industry (the CNA) then responded with talks on various aspects of the recommendations. The morning session focused on the radiological protection of humans (the main subject of ICRP 60). The afternoon session dealt with the radiological protection of non-human species, providing an environmental extension of radiation protection. Each session was followed by small group discussions involving members of the audience from regulators, industry and professional organizations such as COMP. This gave the audience the opportunity to prepare questions and comments for further discussion and for feedback to the ICRP.

The ICRP's draft revised recommendations on radiological protection have been posted on the ICRP website (at http:// www.icrp.org/icrp_rec_june.asp) for some time and comments are being solicited by the commission (http://www.icrp.org/ remissvar/listcomments.asp).

In the morning session Dr. Holm gave an excellent review of the development of radiation protection from ICRP 26 in the 1970's through ICRP 60 and into the current suggested recommendations. He reminded us that since ICRP 26 the main intent of the recommendations was to prevent deterministic effects and minimize stochastic harm, to put forward justification through cost benefit/effectiveness analysis, to achieve optimization through ALARA, and to effect protection through the introduction of dose limits. ICRP 60 used much the same approach, with some slight modifications to clarify nomenclature and to incorporate newer radiation biology information. The current recommendations maintain these basic principles but incorporate changes for clarification and to accommodate the shifting values in the community around us, which now gives more emphasis to the individual rather than the communal society.

In reviewing the need for a new document Dr. Holm noted that since ICRP 60 in 1990 there had been ten additional ICRP publications with nearly 30 different numerical restrictions on dose depending on different specific applications. These restrictions span about five orders of magnitude. There had also been a policy suggesting environmental protection. One aim of the new ICRP recommendations is to consolidate these into a single set of recommendations. Dr. Holm also noted in his review that it has been difficult to show compliance to the public dose limit, motivating the introduction of dose constraints in the draft recommendations. Finally, he noted that our scientific knowledge of various biological assumptions had improved since publication of ICRP 60 necessitating revision of some specific points in ICRP 60.

The aim of the new recommendations is still to provide an appropriate standard for protection for humans (and, where necessary, for other species) without unduly limiting the beneficial actions giving rise to radiation exposure. The scope of the new recommendations covers exposures to both natural and artificial sources of radiation as far as they are controllable and to apply control to the sources or pathways leading to doses to individuals. The recommendations are still based on the linear non-threshold hypothesis (LNT).

Table 1 summarizes some of the features of the new recommendations. Some changes can be described as changes in nomenclature to more clearly designate a quantity/effect or to differentiate it from a close counterpart. Others, including changes in radiation weighting factors and tissue weighting factors, reflect changes in radiobiological information since the publication of ICRP 60.

At the symposium, the changes resulting from the analysis of new biological and dosimetry data did not excite too much discussion during the replies from industry and regulatory agencies, or during the small group discussions. There was, however, a general concern expressed about the nomenclature changes. From experience after ICRP 60, a significant number of attendees feared the changes would lead to more confusion than clarification. The general thought was that it had taken years to get people familiar with the ICRP 60 terminology, why change again? The term "ALARA" is being de-emphasized and the focus is now on building a protection culture that minimizes the risk of accidents; will the new terminology be as memorable and as motivating to workers?

One entry in Table 1 does warrant further comment. The increase in w_T for breast arises from updates to the Japanese bomb survivor data reflecting excess cancers in women exposed as juveniles. For the whole population, the ICRP now uses a

(Continued on page 24)

Draft ICRTP 2005… (Continued from page 23)
nominal risk coefficient of 0.0121 cancers induced /person/year/ Sv, and a lethality of 0.29. This is relevant to the risk-benefit calculation for mammographic screening. For more information, the interested reader should get the report from the ICRP website and examine Appendix A.

It was one additional conceptual change in the recommendations that initiated the main discussion throughout the morning. The ICRP is concerned that it has been difficult in practice to show compliance to the dose limits for the public. There are a few reasons for this, including the fact that the public exposure is the sum of the contribution from many sources and the regulation of the exposure can only be regulated at individual sources. To correct this difficulty the ICRP proposes to introduce the concept of *dose constraint* to restrict the individual dose from a given source. The dose constraint will specify some level of projected dose from a source above which some intervention is almost certain to be warranted. For each source the constraint would specify basic levels of protection to be applied to most exposed individuals. There would be separate constraints for normal exposure conditions (say 20 mSv yr^{-1} for occupational exposure) and for workers in emergency situations (100 mSv yr^{-1} when not involving saving a life). There would be a minimum dose constraint of 0.01 mSv yr^{-1}. These constraints are not to be confused with dose limits, which specify the individual exposure leading to unacceptable risk under normal conditions. However, the general consensus from the meeting was that confusion between dose limits and dose constraints would occur and dose constraints would become *defacto* limits. Since dose constraints might be lower than dose limits this might lead to unexpected reductions in limits when translated into regulations by politicians, regulators, and administrators in consultation with the public. We expect that the issue of dose constraint will provoke much discussion in the continuing review of the draft recommendations.

The changes outlined above were, to our mind the most interesting to our profession. In the afternoon session the discussion focused on the ICRP recommendations for the radiological protection of non-human species. This is not some flight of fancy but is driven by the pragmatic need of industry and regulators for a standard tool to use for assessing radiation protection under the environmental assessment process required to approve new nuclear facilities in nearly all countries. The ICRP has been somewhat slow off the mark on this and Dr. Holm alluded to the difficulties that occur when environmental legislation is not formulated in the context of good science. We would describe the ICRP status on this as a "work in progress". Much of their effort seems concentrated on generalizing the "Reference Man" concept by defining model standard non-humans to enable calculation of effective dose from natural and man-made radioactive sources in the environment. As you can imagine, the extension of radiation protection to the environment has raised some concern for industry; not in the suitability of making this extension, but more on the implications which may arise of details of the recommendations applied to non-human species yet to be established. It is also clear that the CNSC has positioned itself to be front and centre in environmental review of Canadian facilities and looks forward to building this part of its mandate. It was not clear to us, however, to what extent the relevant scientific questions will be radiological as opposed to biological /physiological /animal behaviour etc. Likely these developments will have little impact on medical facilities using ionising radiation, but will certainly affect the uranium mining industry and nuclear reactor

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Feature	ICRP 60	Draft Recommendations	Comment
Nomenclature Change			
Radiation quantity	Equivalent Dose (H)	Radiation Weighted Dose (H)	To reduce confusion with the term "effective dose".
Biological effect	Deterministic effects	Tissue Reactions	More descriptive of actual concern
Change From New Radiobiological/Dosimetry Information			
Radiation Weighting factor (w_R)	Protons = 5 Neutrons = function of energy	Protons = 2 Neutrons reduced by a factor of 2 for energies < 1 MeV	Reduction of w_R
Tissue Weighting Factors (w_T)	Gonads = 0.2 Breast = 0.05 Remainder = 0.05	Gonads = 0.05 Breast = 0.12 Brain, Kidney, Salivary Glands = 0.01 Remainder = 0.1	Reduced Increased Three tissues added Increased
Fatal Cancer nominal probability coefficient	5.0 % Sv^{-1}	4.4 % Sv^{-1}	Small drop in coefficient (also in detriment coefficient)
Dose Limit Changes			
Worker Dose Limits	20 mSv/yr (100 mSv over 5 years)	same	unchanged
Public Dose Limits	1 mSv/yr	1 mSv/yr (5 mSv over 5 years)	In special circumstances

Table 1: Some highlights of the changes between the draft ICRP recommendations and ICRP 60. This list is not comprehensive.

Report on DOSEGEL 2004 Meeting

Submitted by Michelle Hilts
Vancouver Island Cancer Centre, Victoria, BC

The third international conference on radiotherapy gel dosimetry, DOSGEL 2004, was held Sept 13th to 16th in Ghent, Belgium. It was a fabulous meeting: great science, good friends and a vibrant, picturesque city. What more could you ask for?

The meeting venue was a converted monastery in the heart of the old city. Here, in the city's centre, stone bridges span canals which weave between cobble-stoned streets and the spires of three cathedrals dominate the main square. Nearby, a beautifully revived medieval quarter has its narrow streets brimming with restaurants. Add to this atmosphere the famous chocolate, the fresh cooked waffles and the endless flavours of excellent Belgian beer and you have not a bad place for a meeting!

Gel dosimetry research is highly multidisciplinary and the DOSGEL conferences are forums that bring together a wide range of researchers (imaging and radiation specialists, material scientists and chemists) to discuss their recent research, thoughts and visions for the future of gel dosimetry. DOSGEL 2004 was no exception in this regard. In fact there were several important firsts at this meeting. Two radiation oncologists attended the meeting, demonstrating the growing clinical interest in gel dosimetry. The addition of their clinical perspectives into the research foray was a meeting highlight. The active and enthusiast involvement of a chemical engineer added a new area of expertise to the meeting and created a vibrant focus for discussion of fundamental gel chemistry and properties. Finally, two corporate vendors, MGS Inc. (USA) and Modus Medical Inc. (CAN) were on hand to display the latest in their gel dosimetry imaging technology. Overall the group was impressively diverse with attendees from across Europe as well as from Australia, Brazil, Canada, India, Iran, Syria and the USA.

Canadian researchers have been pioneers in many aspects of gel dosimetry and a strong Canadian contribution to this field continues. I'm proud to report that the "CanCon" at this meeting was exceptionally high. 8 physicists, 1 chemical engineer and 1 corporate sponsor, from all across Canada (quite literally, from NS to BC), attended the meeting. 7 proffered papers and 4 invited review lectures (1/3 of all the review lectures!) were presented by Canadians. Way to go!

The overall quality of both the review lectures and proffered papers was excellent. The proceedings, published in the *Journal of Physics: Conference Series*, are available on-line at http://www.iop.org/EJ/journal/Conf. Works were presented on many aspect of gel dosimetry. Fundamental studies investigated gel chemistry, gel properties and new formulations of gel dosimeters with particular emphasis on finding polymer systems that can be manufactured on the benchtop, in the presence of oxygen. Imaging studies at this meeting largely focused on the optical and x-ray properties of gel dosimeters, perhaps demonstrating an increasing interest in finding alternatives to the expense and frequent inaccessibility of MRI. MRI, the best established gel imaging technique, shone in the application papers. These were dominated by IMRT but also included SRS, brachytherapy and several other novel applications (e.g. grid therapy, synchrotron irradiation and measurement of diagnostic CT doses). Highlights included:

- A review lecture by Kim McAuley, a professor of chemical engineering at Queens University, entitled: "The chemistry and physics of polyacrylamide gel dosimeters: why they do and don't work". She just seemed to address many questions!
- The introduction of a new polyurethane based 3D dosimeter by John Adamovics (Heuris Pharama LLC, USA) called Presage™. The dosimeters are radiochromic (containing leuco dyes) and are read-out by optical scanning.
- Kevin Jordan's (London ON) entertaining (practical?) demonstration of how to make a bench-top optical CT scanner for $5. All you need is your scanning water tank, a laser pointer, string, tape… Please email Kevin for details!
- A demonstration by the group from Ghent that, given appropriate expertise, MRI gel dosimetry can truly provide top quality 3D dose measurements. They presented 3D results for an IMAT (intensity modulated arc therapy) application that were fundamental in the clinical decision making for that treatment.

Finally, l'm pleased to report that the next DOSGEL conference will be held in Canada. The meeting will be hosted by Martin Lepage in the fall of 2006 in Sherbrooke QC. Further information will be posted at www.dosgel.org. It promises to be another excellent meeting and I look forward to joining you in Sherbrooke in 2006!

Michelle's travel to DOSGEL2004 was generously supported by the CCPM through a Harold E. Johns Travel Award

Pictures from DOSEGEL 2004 Meeting

Cruising the canals

The BC (and ex-BC) crowd

Choosing a restaurant in the medieval quarter

DOSGEL 2004 Canadian contingent

Kevin and John M. (missing from "Cancon" photo)

Ghent old city centre

Enjoying that Belgian beer!

Breast permanent seed implant
—A world premiere at Toronto Sunnybrook Regional Cancer Centre

Submitted by William Que
Ryerson University, University of Toronto, and Toronto Sunnybrook Regional Cancer Centre, Toronto, ON

Nancy lives in rural Nova Scotia, about four hours drive from Halifax. She was recently diagnosed with breast cancer, had a lumpectomy, and need radiation treatment. If she decides to go for radiation treatment, that means leaving her work and home for 5 weeks to stay in a hotel in Halifax, so that she can visit a cancer centre equipped with a medical linear accelerator every weekday to get her daily dose of radiation. It would be a long, physically and mentally exhausting ordeal, as well as costly to her. Her other option is to simply stay home and forgo the radiation, gamble on the odds that the cancer won't re-occur. She has not yet made up her mind. If she forgoes the radiation, she is not alone--- recent studies [1,2] show that 15% to 30% of women treated with breast-conserving surgery for early stage disease failed to undergo breast radiation.

Karen Todkill lives in Toronto, and also recently had lumpectomy following a diagnosis of breast cancer. When she heard that there is a new clinical trial offering radiation treatment in just one visit, she signed up for it immediately. On May 13, 2004, she became the first patient in the world to receive a permanent Pd 103 seed implant to treat breast cancer. Since then, she has had no side effects, and had a completely normal way of life. She was able to go back to work the next day. On Sept. 8, 2004, she appeared on CBC National News telling the whole world how she felt after the implant. She mentioned that the doctor prescribed some pain relief medication for her, but she never even opened the bottle.

So the history of breast permanent seed implant has started with a big bang at Toronto Sunnybrook Regional Cancer Centre. The phase I/II clinical trial was initiated by radiation oncologist Dr. J.P. Pignol, with the medical physics technical support of Brian Keller, Raxa Sankreacha, and William Que. This trial is financially supported by a research grant of $283,858 from the Canadian Breast Cancer Foundation, and Mentor Canada, which donated the Pd-103 seeds. So far, 12 patients have received the treatment, and a total of 65 patients will be recruited into the trial. All patients are accrued into the phase I/II clinical trial with informed consent. Eligible patients are those with infiltrating ductal carcinoma (not lobular) measuring less than 3 cm, with surgical margin of 2 mm or more, no extensive in situ carcinoma, no lympho-vascular invasion, and less than 3 out of 10 positive lymph nodes or a negative sentinel lymph node biopsy. A minimum peripheral dose of 90 Gy was prescribed to the target volume (TV). The TV includes the surgical cavity and the fibrous scar as seen on a pre-implant CT-scanner, plus a margin of 1 cm modified to 5 mm deep to the skin surface and along the *fascia pectoralis*. All twelve breast seed implant procedures were performed by Dr. J. P. Pignol under neuroleptanalgesia (Fentanyl, 100 mg and Midazolam 0.3mg/kg) and local anaesthesia (Bipuvacaine HCl 5% and Xylocaine 2%). The procedure occurs in a single one-hour treatment session. Patients are evaluated every other week with a clinical examination and chest x-ray to assess seed motion. A CT scan is performed immediately following the procedure and at 2 months following the implant to assess the dose distribution (see cover of this issue). To date, the seed implant has only been associated with minor discomfort in two patients. The average target volume was 41.9 cc (SD 7.5 cc) and an average of 80.9 seeds of strength 1.23 mCi per seed have been used (SD 8.7 seeds) corresponding to an average total implanted activity of 99.5 mCi. Review of dosimetry plans demonstrate that the portion of the target volume receiving at least 100% of the prescribed dose (V_{100}) was 94.9% on average (SD 2.5%), and the portion receiving 200% or more (V_{200}) was 17.1% on average (SD 1.6%).

According to the Nuclear Safety and Control Act, while the annual dose limit to the general public is 1 mSv, those who care for a patient receiving radionuclides are permitted to exceed the 1 mSv limit. In particular, according to the report released in February 2000 by the Advisory Committee on Radiological Protection [3], the adult family caregivers of the patient are subject to a dose constraint of 5 mSv. A similar recommendation is given by the National Council on Radiation Protection and Measurements Commentary #11 [4]. For patients receiving Pd-103 breast seed implant, the radiation exposure rate at 1 meter from the patient immediately following the implant is 1.8 mR./h on average (SD 0.8 mR/h). Although this is higher than that associated with prostate seed implants (0.14 mR/h at 1m from a prostate implant patient [5]), the exposure level remains safe since it translates to a maximal effective calculated dose of 1.05 mSv (SD 0.39 mSv) to a partner living together with the patient. Furthermore, if the partner sleeps in a separate room for the first three weeks following the implant procedure, he or she can reduce the exposure to about 50%. Exposure to coworkers of the patient can be reduced to negligible levels if the patient wears a metallic sheet in the bra for several weeks. Other members of the general public will not receive significant dose from the patient.

A major factor in the initiation of the breast permanent seed implant for the treatment of early stage breast cancer is the success of the prostate permanent seed implant for the treatment of early stage prostate cancer. Today, about 1/3 of eligible patients in the U.S. elect to have prostate permanent seed implant over prostatectomy. They experience less severe side effects compared to those patients receiving prostatectomy. Toronto Sunnybrook Regional Cancer Centre started performing prostate permanent seed implants in January 1998 and has accumulated significant expertise in seed implants. It is the first clinic in Canada receiving RTOG credential for prostate implants. These experiences helped the staff to meet the challenges of breast seed implants.

Despite some of the similarities with prostate seed implants, a breast seed implant is a completely different procedure. For one thing, there is no more rectal ultrasound. The breast ultrasound

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Breast permanent seed implant…. (Continued from page 27)
does not provide the transverse images like the ones used for planning prostate implants, and in this case the ultrasound modality is inferior compared to x-ray CT for target delineation. Planning for breast seed implants is based on oblique x-ray CT images. With no specially designed planning software to use, physicist Raxa Sankreacha developed a makeshift breast seed implant planning system making use of two entirely unrelated systems. The first part of planning is done on the ACQSim software, designed for external beam radiation, while the second part of planning is done on the VariSeed software, designed for prostate seed implant. In-house machine shop manufactured the implant template, fiducial needle, and ultrasound securing device. Lead physicist Brian Keller created gel breast phantoms that amazingly mimic the real breast in terms of texture, shape and size (ask Brian how he got the expertise) so that the physician could practice on the phantoms before doing implants on patients, and these phantoms were also very useful for radiation exposure level measurements. Brian also created some circularly shaped metallic shielding sheets that could be slid into a bra (ask Brian where he got that idea!) in case the breast tissue alone is not sufficient to shield the radiation to an acceptable level. So far, by carefully selecting patients with deep seated tumor beds, there has been no need to use the metallic sheets for shielding except for one patient. William Que calculated the prescription dose based on the external beam dose of 50 Gy over 25 fractions, and determined that the equivalent dose for Pd-103 permanent implant should be 90 Gy. Together with different professionals, the team was a cohesive unit that achieved greatness no single individual could achieve alone. Of course, the main driving force and leader of the team is radiation oncologist Dr. Jean-Philippe Pignol. His enthusiasm and vision made this progress in cancer research and treatment possible.

The accompanying picture shows the setup for breast seed implant. At the top of the picture, one can see an ultrasound probe on top of the breast. The ultrasound probe is held in place by an artificial arm manufactured in-house. Placed lateral to the breast is a template, similar to the one used for prostate implant. One difference is that in the centre of the template, there is a special hole for a fiducial needle, which marks the centre of the target and the desired depth for needle insertion. A needle loaded with Pd-103 seeds is being inserted. Unlike the prostate implant, the breast implant does not use a stepping unit.

The idea for breast seed implant was also motivated by recent studies of HDR and LDR brachytherapy treating the tumor bed in breast. King et al. reported a series of 50 patients treated using HDR 32Gy in 8 fractions, or LDR brachytherapy 45 Gy in 4 days [6]. This series had a very low rate of local recurrence of 2% at 6 years. On the other hand, a high incidence of skin telangiectasia (12%) and fat necrosis (24%) was noticed. Preliminary Data of the RTOG 97-17 clinical trial reported an

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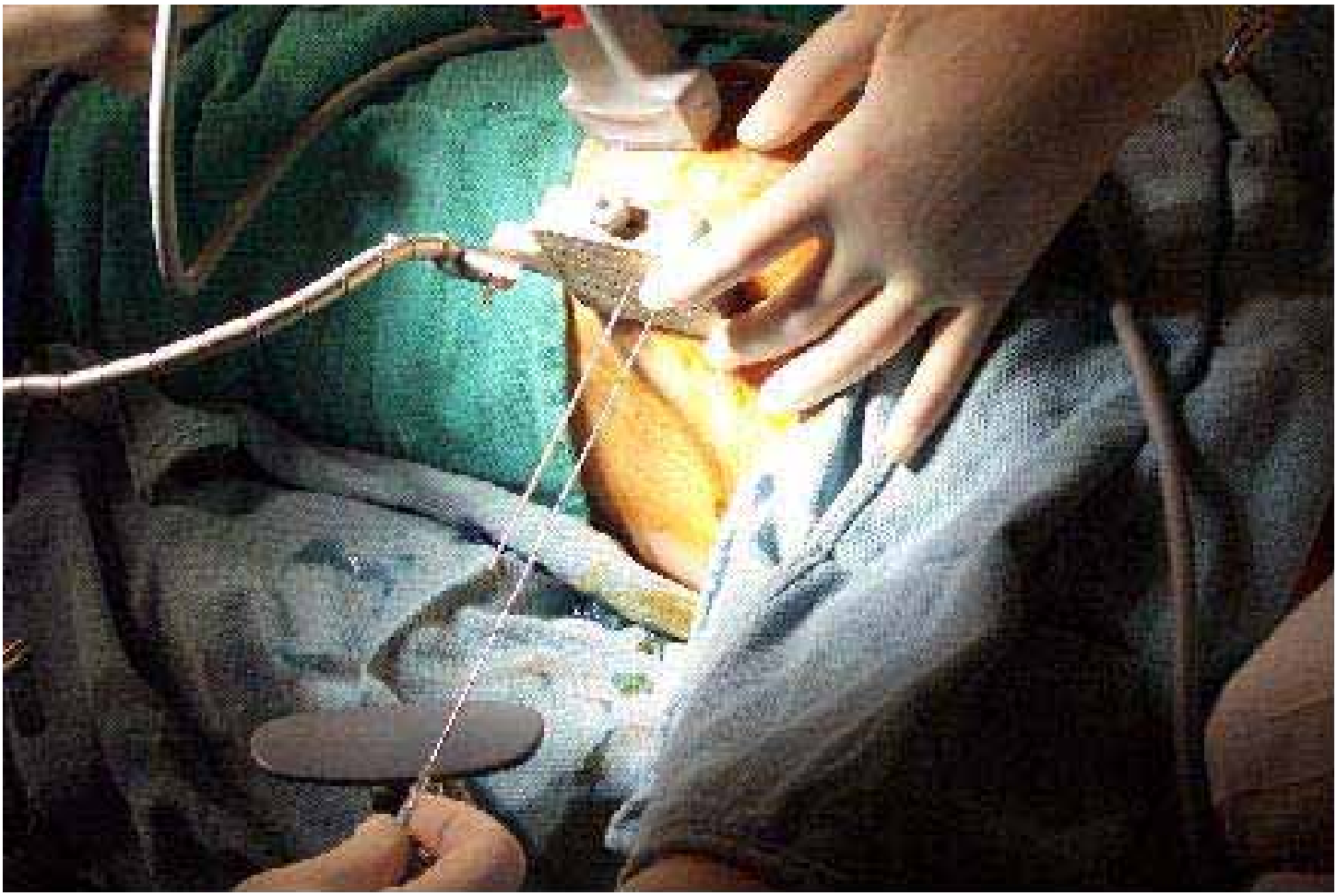


Figure 1: Setup for breast seed implant.

Report on Clarke Symposium

Submitted by P.C. Johns and D.W.O. Rogers, Carleton University, Ottawa, ON

OMPI 15 Year Symposium and the R. L. Clarke Graduate Scholarship in Medical Physics

The 15-year anniversary symposium of the Ottawa Medical Physics Institute (OMPI), on 5 November 2004 at Carleton University, was a huge success. Fascinating talks on biophysics/radiobiology, therapy physics, and medical imaging were given by OMPI members Peter Raaphorst (the founding Director of OMPI), Dave Rogers (the founding Secretary of OMPI), and Ian Cameron (the second Director of OMPI). History of the field, the role of past and present students, and a look to the future were liberally mixed. Highlights were the presentations by Bob Clarke - who asked the perennial questions *Where are we? And how did we get here?* - and by keynote speaker Charlie Ma on *The Future of Medical Physics: A Therapy Physicist's Perspective*. Charlie Ma, a former OMPI member, is currently Director of Radiation Physics at the Fox Chase Cancer Center in Philadelphia.

After the scientific talks, Dr. Jean-Guy Godin, the Dean of Science at Carleton University, reported on the R. L. Clarke Graduate Scholarship in Medical Physics. Established by the friends and colleagues of Robert L. ("Bob") Clarke, Professor Emeritus and founder of the OMPI, the purpose of the scholarship is to provide recognition, encouragement and assistance to an outstanding graduate student in the M.Sc. or Ph. D. program in medical physics, usually in their first year of graduate studies at Carleton.

Bob Clarke was instrumental in establishing the medical physics graduate program at Carleton and spent his career championing student causes. He was Chair of Physics from 1971-1977 and a member of numerous University committees and bodies, including Senate and the Board of Governors. He was appointed to several provincial committees, including the Council of Ontario Universities' Physics Departments committee, and was an executive member of the Canadian Association of Physicists. Although Bob officially retired 17 years ago, he participates daily in the activities of Carleton's Physics Department and is an advocate for its students. The scholarship embraces Dr. Clarke's vision of student support by recognizing, encouraging and assisting outstanding graduate students in the field of medical physics.

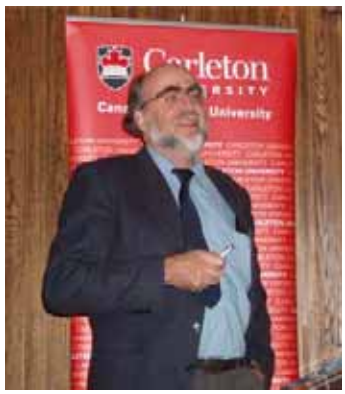
The internal campaign of OMPI Members and members of the Carleton Department of Physics, launched at the end of September, has had great momentum. Over $45k has now been donated or pledged to build the endowment of this scholarship. To reach the target of $250k, the campaign is now moving to the larger community, including graduates of the program and other friends of Carleton, and to potential corporate donors.

The OMPI 15 Year Symposium was followed by a dinner in downtown Ottawa. The afternoon and evening were a great time for remembering where Ottawa medical physics has been, recognizing accomplishments, and for targeting the future. Connections with past and present colleagues were updated and an enjoyable time was had by all. Thanks to everyone who attended, from near and far.

For further information on the scholarship please see
http://www.science.carleton.ca/clarke/
or email Jana Rand at jana_rand@carleton.ca

Bob Clarke

Rob deKemp



G. Peter Raaphorst

Ian Cameron

Bog Jarosz, Vera Clarke, Bob Clarke, Paul Johns

More Pictures from the Clarke Symposium

Bob Clarke, Lili Chen, Charlie Ma

Bog Jarosz, Vera Clarke, Bob Clarke, Paul Johns

Bob Clarke, Vera Clarke, Pauline Lacroix, Paul Johns

Dallas Santry, Lucy Nedialkova, Lourdes Garcia-Fernandez

Don Wiles, Lesley Buckley, Sean Kelly, Iwan Kawrakow, Randy Taylor

Pat Kalyniak, Lili Chen, Lucy Nedialkova, Charlie Ma, Macro Carlone, Dave Rogers

Peter Raaphorst and Walter Huda

Breast permanent seed implant… (Continued from page 28)
accrual of 100 patients who received either 45 Gy LDR, or 34 Gy HDR in 10 fractions [7]. The results of the RTOG 97-17 have not been published yet, but extensive data regarding acute and late side effects were reported at ASTRO 2002. It is noticeable that the rate of fat necrosis and telangiectasia was low compared to the King series. This is possibly related to the use of a rigid template to maintain the HDR tube parallel during HDR procedure. In 2002, Wazer reported a multi-institutional study of 33 patient receiving HDR brachytherapy 34Gy in 10 fractions [8]. In the Boston experience of about 33 patients reported by Wazer, only one patient had a recurrence at 5 years (3%), and the recurrence occurs elsewhere in the breast, at least 9 cm from the primary scar. No acute skin toxicity was reported. Vicini also reported very encouraging results from the William Beaumont Hospital experience of limited-field radiotherapy using either LDR (120 patients), or HDR (79 patients) brachytherapy [9, 10].

On Sept. 8, 2004, CBC National reported the breast seed implant treatment at TSRCC in the evening news. The next day, all major newspapers in Canada covered the story with front page articles. Since then, the team has received many inquiries. In November 2004, a radiation oncologist from the U.S. flew in on his private jet to visit TSRCC in order to observe the procedure. If the clinical trial at TSRCC becomes successful, Toronto could become Seattle North of breast seed implants. This would give a boost to Canada's image as a leader in radiation therapy, somewhat forgotten in the international community in recent years.

I would like to thank Brian Keller and Raxa Sankreacha for encouraging and useful comments during the preparation of this article.

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ACROSS CANADA… (Continued from page 15)
polymer gels. He is actively involved with us in developing a graduate program in Medical Physics through UVIC. We currently have 3 MSc students in the program.

Figure 1: "The BEAM Team", bringing IMRT Monte-Carlo calculations into clinical practice

Back row from left to right: Tony Popescu, Sergei Zavgorodni, Gavin Cranmer-Sargison (UVIC MSc student), and Derek Wells.
In front left to right: Conor Shaw (UVIC Co-op student) and Wayne Beckham

Draft ICRP 2005… (Continued from page 24)
facilities.

In summary, this was an excellent opportunity to become familiar with the draft ICRP recommendations. The day was one of the best single day focus meetings we have attended being well founded on the two talks from Dr. Holm, an excellent speaker, and built up by the replies from various concerned parties and by the discussions in the small groups and the general assembly. Medical physicists involved with radiation protection are advised to get the draft recommendations from the ICRP website. The consultation period was to end 31 Dec 2004 but it could still be possible to submit comments to the ICRP. And certainly, the COMP Radiation Safety & Technical Standards Advisory Committee is always welcoming of useful input.

Message from the CCPM President … (Continued from page 5)
been somewhat haphazard but look for a more focused approach in the future!

Also on the agenda was the topic of **French language** options. Although we have not translated our written membership examination questions into French, it has always been our practice to offer candidates the option of providing answers in either French or English and several candidates in the past have chosen to give written responses in French. With the introduction of the membership oral examination last year, we are very willing to provide the same option for the oral examinations. However, we ask that a candidate seeking an examination in French will so indicate prior to the examination so that we can schedule the appropriate resources. Not all of our examiners are sufficiently fluent in French to provide this service.

I will close by wishing you all a happy and healthy 2005.

In Brief

Medical Physics in High School in Manitoba

Submitted by Dan Rickey
CancerCare Manitoba, Winnipeg, MB

With the help of Medical Physicists at CancerCare Manitoba, Medical Physics will become part of Manitoba's high school physics curriculum. The curriculum change is voluntary this year, but will be mandatory in the 2005/2006 academic year. The Medical Physics unit is focused on radiation and its effect on the human body. For example, one section compares ionizing and non-ionizing radiation. The last section requires the students to research a particular area of medical physics, e.g., planar x-ray imaging or brachytherapy, and examine the relevant application of radiation. The aim is to make physics more relevant to the students. To introduce this subject to science teachers, two physicists (McCurdy & Rickey) gave presentations on Medical Physics at the Science Teacher's Association of Manitoba conference. The sole complaint from the standing-room-only group was that they wanted even more medical physics from us!

COMP OCPM

CANADIAN ORGANIZATION OF MEDICAL PHYSICISTS

ORGANISATION CANADIENNE DES PHYSICIENS MÉDICAUX

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(3 year Term from January 1st, 2006)

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Trésorier

(Terme de 3 ans commençant le 1er janvier 2006)

La mise en candidature doit être signée par deux membres actifs et par le(la) candidat(e) qui indique par sa signature qu'il(elle) accepte la mise en candidature.

Envoyez vos mises en candidature à:

Clément Arsenault, Ph.D., MCCPM
COMP Past-Chair
Centre d'oncologie Dr Léon-Richard
Moncton, NB E1C 8X3
Tel: (506) 862-4151
Fax: (506) 862-4222
E-mail: carsenault@health.nb.ca

DEADLINE : FEBRUARY 28, 2005

The results will be reported at the Annual General Meeting in Hamilton in July 2005.
(see Article IV.B(6&7) of COMP Bylaws)

DATE LIMITE : 28 FÉVRIER 2005

Les résultats seront rapportés à la réunion générale annuelle à Hamilton en juillet 2005.
(Voir articles IV.B(6 et 7) des règlements de l'OCPM)

Nominee :

Accepted by nominee :

Sponsors: 1)

2)

Candidat(e) :

Acceptée par le(la) candidat(e):

Parrains: 1)

2)

2005 Sylvia Fedoruk Prize in Medical Physics

The Saskatchewan Cancer Agency is pleased to sponsor a competition for the 2005 Sylvia Fedoruk Prize in Medical Physics. This award is offered annually to honour the distinguished career of Sylvia Fedoruk, former Lieutenant-Governor of Saskatchewan and previously physicist at the Saskatoon Cancer Centre.

The prize will comprise a cash award of five hundred dollars ($500), an engraved plaque and travel expenses to enable the winner to attend the annual meeting of the Canadian Organization of Medical Physicists (COMP) and the Canadian College of Physicists in Medicine (CCPM), which will be held on July 7-9, 2005 in Hamilton.

The 2005 Prize will be awarded for the best paper on a subject falling within the field of medical physics, relating to work carried out wholly or mainly within a Canadian institution and published during the 2004 calendar year. The selection of the award-winning paper will be made by a panel of judges appointed by COMP.

Papers published in *Physics in Medicine and Biology* and *Medical Physics*, which conform to the conditions of the preceding paragraph, will automatically be entered in the competition and no further action by the author(s) is required. All other papers must be submitted individually. Four (4) copies of each paper being entered must be sent to:

Peter O'Brien, FCCPM,
COMP Chair,
Toronto Sunnybrook Regional Cancer Centre,
2075 Bayview Avenue,
Toronto, Ontario,
M4N 3M5
Tel: (416) 480-4622
Fax: (416) 480-6801
E-mail: peter.o'brien@sw.ca

Each paper must be clearly marked: "Entry for 2005 Sylvia Fedoruk Prize" and must reach the above address no later than **Friday, February 26, 2005**.

The award winners from the last four years were:

A. Samani, J.Bishop, C. Luginbuhl, D. Plewes, " Measuring the elastic modulus of ex-vivo small tissue samples", *Physics in Medicine and Biology*, **48**, 2183-2198 (2003)

J.H. Siewerdsen, I.A. Cunnigham and D.A. Jaffray, "A framework for noise-power spectrum analysis of multidimensional images", *Medical Physics,* **29,** 2655-2671 (2002)

B. McCurdy, K. Luchka and S. Pistorius, "Dosimetric investigation and portal dose image prediction using an amorphous silicon electronic portal imaging device", *Medical Physics,* **28**, 911-24 (2001).

M. Lachaine and B. Gino Fallone, "Monte Carlo simulations of x-ray induced recombination in amorphous selenium", *J. Phys. D: Appl. Phys.,* **33**, 1417-23 (2000).

Harold Johns Travel Award Announcement
Deadline for Application: 7th March 2005

The Board of the Canadian College of Physicists in Medicine is pleased to honour the Founding President of the College by means of the Harold Johns Travel Award for Young Investigators. This award, which is in the amount of $2000, is made to a College member under the age of 35 who became a member within the previous three years. The award is intended to assist the individual to extend his or her knowledge by travelling to another centre or institution with the intent of gaining further experience in his or her chosen field, or, alternately, to embark on a new field of endeavour in medical physics.

The H. E. Johns Travel Award is awarded annually by the Canadian College of Physicists in Medicine to outstanding CCPM Members or Fellows proposing to visit one or more medical physics centres or to attend specialized training courses such as the AAPM summer school. The applicant should not have previously taken a similar course or have spent a significant amount of time at proposed institutions. The award is for $2,000 and will be paid upon receipt of a satisfactory expense claim. The deadline for application is four months prior to each CCPM annual general meeting. All applicants must have written and passed the exam for membership in the CCPM within the previous three years. They should supply a one page proposal indicating the course they wish to attend or the name(s) of the institutions they would visit and the reasons for their choice. They should also supply an estimate of the costs involved and letters from their present employer indicating that they are in agreement with the proposal. For a visit to an institution the candidate must have the institution write to the Registrar in support of the visit. The candidate should also provide their curriculum vitae and the names and phone numbers of two references whom the Awards Committee can contact. No reference letters are required. The Awards Committee reserves the right to contact additional individuals or institutions.

Applicants may travel either inside Canada or elsewhere. If their proposed expenses exceed the value of the award, then they should also indicate the source for the additional funds required.

The award is intended both to assist the individual in their medical physics career and to enhance medical physics practice in Canada. Recipients are therefore expected to remain in Canada for at least one year following their travel. Applicants should be working in Canada but need not be Canadian citizens.

Successful candidates will have two years after their application deadline to complete their travel. They will be required to submit a short report to the Canadian Medical Physics Newsletter.

The award recipient will be chosen by a committee consisting of the Chairman of the Examining Board, The Registrar and the President of the College. Their choice will be based upon 1) the written proposal submitted by the candidate, 2) references obtained by the committee and 3) membership exam results. The award will be announced at the Annual General Meeting of the College.

Unsuccessful candidates in any one year who are still eligible in subsequent years may have their applications considered again by writing to the Registrar and providing any necessary updated information.

Applications should be sent to:
Dr. Wayne Beckham
The Registrar
Canadian College of Physicists in Medicine
c/o BC Cancer Agency, Vancouver Island Centre
2410 Lee Avenue, Victoria, BC, Canada V8R 6V5

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• Kingston General Hospital

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The radiation safety role involves the administration and coordination of all aspects of radiation safety throughout the organization. This includes administering various licences, ensuring compliance with relevant regulations and legislation, instrumentation and equipment assessment, inventory management, contamination control, policy and procedure development, and training.

As a physicist, the successful applicant will be joining a group of medical physicists in Radiation Oncology at the Cancer Centre of Southeastern Ontario. Depending on the applicant's clinical specialty, medical physics duties will be in the Department of Medical Physics at the Cancer Centre or in the Department of Imaging Services at KGH. Duties include regular clinical coverage in your specialty: equipment commissioning and quality assurance, calibration, treatment planning and or imaging support, and training of technologists and medical and physics residents. All medical physicists are expected to be active leaders in the development of technical and clinical improvements in the imaging and/or radiation treatment programs of KGH and the Cancer Centre. Applicants with good evidence of research and/or development activity will be encouraged to join research opportunities in the hospital's Diagnostic Radiology and/or Medical Physics Departments and will be eligible for academic appointments in the Departments of Diagnostic Radiology or Oncology at Queen's University. Opportunities exist to supervise medical physics graduate students in the Department of Physics at Queens University.

Candidates for this position must be fully-trained Medical Physicists with a postgraduate degree (Ph.D. preferred) and a minimum of five years of post-training experience in clinical radiation therapy or nuclear medicine physics. The applicant should have an established background in radiation safety with indications of good communication and management skills. Membership in the Canadian College of Physicists in Medicine or equivalent is preferred.

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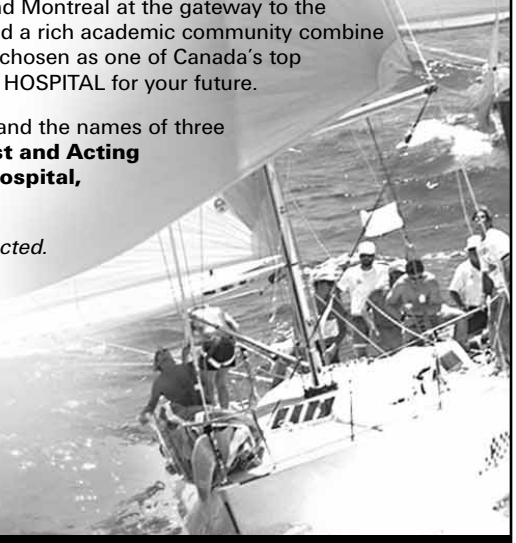
Applications are invited from all qualified candidates. Please submit a curriculum vitae and the names of three professional referees, to: **L. John Schreiner, Ph.D., FCCPM, Chief Medical Physicist and Acting Radiation Safety Officer, C/O Human Resources Services, Kingston General Hospital, 76 Stuart Street, Kingston, Ontario K7L 2V7 e-mail: kghhr@kgh.kari.net**

We thank all applicants; however, only those individuals to be interviewed will be contacted.



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