InterACTIONS

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Cover Image

A collage of photographs from Dr. Orest Ostapiak's visit to India and participation in the 31st Annual Conference of Association of Medical Physicists of India held at the Sanjay Gandhi Postgraduate Institute of Medical Sciences in Lucknow. Read Dr. Ostapiak's full report on page 13

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Message from the COMP President

As is now established tradition, the mid-year Board meeting was conducted in Toronto on November 25 and 26. While much of the business of the Board is conducted via teleconference, having this meeting and the one at the Annual Scientific Meeting (ASM) has proven to be invaluable. The CCPM Board also meets at the same time in the same venue so the two Boards also take advantage of having a joint meeting to address issues of mutual interest. As a result, much of this message is providing an update on activities arising from that meeting.

There is a significant amount of modification of the COMP governance structure currently being considered. While the Terms of Reference for all committees are undergoing an annual review, some substantial changes are being proposed. While many of these changes are intended to better establish the distinct roles of the COMP and CCPM, fundamental considerations in the deliberations are to (i) enhance existing operations and (ii) maintain the excellent relationship currently enjoyed by the two organizations. In an attempt to better consolidate activities associated with the various awards offered by, through, or with the support of COMP, all such activity is to be conducted under the auspices of the Awards Committee. Included in these responsibilities will be the identification of members who will receive the Fellow of COMP (FCOMP). Efforts are well underway to establish a fair and appropriate process that incorporates accommodation of an initial "phasing-in" period. The details of the process will be finalized with a tentative time line that targets solicitation of the first nominations in the latter part of 2011. The Science and Education Committee (SEC) is another example where there are some notable proposed changes that will result in an expansion of responsibilities. One such change is having the representatives to CAMPEP organized to report through the SEC. The SEC will also have a more explicit relationship with the Conference Committee. A proposal to have both the Conference Committee and the Communications Committee report solely to COMP (they each currently report jointly to the COMP and CCPM Boards) has also been agreed to in principle by the two Boards. Finally, the creation of the Executive Committee is on track.

COMP is continuing with its efforts with the Canadian Partnership for Quality Radiotherapy (CPQR). There are several initiatives underway, including revision of the Structural Standards for Quality Assurance at Canadian Radiation Treatment Centres document prepared by the Canadian Association of Provincial Cancer Agencies (CAPCA). A major undertaking for COMP associated with this revision will be the process of developing or updating the equipment specific documents that detail quality control. To this end, a framework is being developed that is intended to make these essentially "living" documents, i.e., there will be a frequency of review that is to keep the content relevant to existing practice. The approach will also include a validation process whereby a treatment facility will exercise new documents as they are being produced, the intent being to ensure appropriateness for use in the practical environment. This effort is being spearheaded by the Quality Assurance and Radiation Safety Advisory Committee (QARSAC) but clearly, once a process has been established, we will be looking to all members of COMP to contribute to the ongoing process.

COMP has committed to participate in a collaborative venture to promote the importance of medical imaging. Other organizations involved include the Canadian Association of Medical Radiation Technologists (CAMRT), the Canadian Association of Radiologists (CAR), the Canadian Association of Nuclear Medicine (CANM), and the Canadian Society of Diagnostic Medical Sonography (CSDMS). Nominally dubbed a "Canadian Imaging Day", the actual details of what the event will entail are still being refined. Regardless, the proposed forum does appear to have

Dr. Peter McGhee
COMP President

real potential for promotion of recognition of medical imaging with a variety of stakeholders.

Somewhat related are efforts by COMP to develop a position statement with regard to Health Canada Safety Code 35, Radiation Protection in Radiology—Large Facilities: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities. Once the statement is available, a communications strategy will be pursued to promote adoption of the Code on as broad a base as possible.

Another real highlight of the recent Board meeting is a commitment of resources to engage a multi-year progressive strategy to establish COMP as a truly bilingual organization. Inspired in part by recent initiatives undertaken by the CCPM, the consensus of the Board was that offering more comprehensive services in French is long overdue.

And now I would like to close on a topic close to a theme I have been attempting to establish. Joe Hayward, who has done an outstanding job as Councillor for Professional Affairs, is approaching the end of his four-year term. The process for identifying his successor will soon be engaged so

(Continued on page 7)

Message from the CCPM President

My eleven year old son took a babysitting course last weekend, to prepare himself for cashing in on the fecundity of neighbours whose social life is being hampered by the proliferation of little people underfoot. He was surprised to learn that there is no such thing as a babysitting licence – anyone, of any age, can declare themselves to be a babysitter. However, he did get a babysitting certificate at the end of the course. While the skill sets are (mostly) different, there are obvious parallels between babysitting and medical physics with regards to the overall regulation of the professions.

In broad terms, there are three levels of regulation of any profession: registration, certification, and licensure; or a combination of these approaches. Registration is simply a formal listing of individuals performing certain work or taking on defined responsibilities. It serves to establish accountability and transparency, but does not evaluate competency. An example is the federal government's Lobbyists Registration System. Anyone engaged in lobbying the federal government is required to register, report on activity, and abide by an enforceable code of conduct. This system does not establish competency through any examination process. Anyone, even really bad lobbyists, can register. However, if they breach the code of conduct (and happen to get caught), then they can be barred from the registry and prevented from getting further work.

Certification is the granting of a certificate based on an assessment of competence. This is a core activity of most professional colleges, including the CCPM. Certification of professionals is not normally performed by government. It is interesting to note that the granting of certificates of competency by the CCPM, like my son's babysitting certification, is not sanctioned by any authority (e.g. government).

It was the clinical medical physicists of Canada who perceived the need for certification of competency and created the College and the certification process in 1979. The main objective of the CCPM is to protect the public by identifying persons who are competent in the practice of medical physics, and as such the CCPM serves the Canadian public, not its members. COMP exists to promote the profession of medical physics and provide services to its members appropriate to a professional organization. CCPM exists to protect the Canadian public from incompetent medical physicists.

Licensure is the exclusive granting by government of legal permission to perform a task, and usually carries penalties for anyone performing that task without a license (e.g. operating a motor vehicle, or possessing radioactive materials). Licensure requires legislative action by government, and normally requires that government be convinced that public harm can result from unlicensed practice.

In the United States, there are currently 4 states which have licensure for medical physicists (Florida, New York, Texas and Hawaii). Three of these states recognize certification by CCPM as a valid qualification for a licence (not yet Hawaii). Four other states are moving toward licensure, and 26 states have some form of registration for medical physicists.

Currently there are no Canadian provinces that licence or register medical physicists (regulation of professions is a provincial jurisdiction). Medical physicists in Alberta have made some moves towards licensure, but there are obstacles blocking progress. In many provinces, the small size of the profession makes it difficult to justify the legislative effort required for licensure.

Regulations regarding qualifications and designation of radiation safety officers are in the federal jurisdiction, both in Canada and in US agreement states (those states which have agreed to use the regulations of the US Nuclear Regulatory Commission). In Canada, RSOs used to be under a kind of registration, because it was a condition of granting a CNSC licence that a RSO be named and

Dr. David Wilkins

explicitly designated. There is now RSO certification -- under Section 15 of the new CNSC Class II Nuclear Facilities and Prescribed Equipment Regulations, the RSO for a Class II facility must now demonstrate qualifications through an assessment which may include an examination, and is issued a certificate of competence. The USNRC records the RSO and the Authorized Medical Physicist on the licence, which is a kind of registration, but its process also looks at qualifications (CCPM certification is recognized for AMP status).

Would licensure be good for the Canadian medical physics profession? Would it be good for the Canadian public? Would it improve patient safety? These are interesting questions, but the CCPM has no official position on this issue; it falls more in the realm of professional advocacy, which is COMP's domain. However, licensure in three of the four states requires board certification, and this is an obvious way to proceed – it makes little sense to establish new mechanisms for assessing competency in each licensing jurisdiction, when CCPM in Canada and ABR in US have well established processes in place. Hence licensure often compliments certification, it does not replace it. We can assume that if medical physics licensing initiatives gain traction in any Canadian

(Continued on page 7)

Message from the Executive Director of COMP/CCPM

.As Peter McGhee mentioned in his article, both the COMP Board and the CCPM Board have just completed their annual mid-year Board meetings in Toronto. Board members of both organizations participated in a joint orientation session that was developed and delivered by David Wilkins (CCPM President) and Peter McGhee (COMP President) and was very well-received by both Boards.

The COMP Board has committed to implementing the necessary changes to make COMP a fully bilingual organization. This is an important and significant undertaking and will be phased in over the next three years. A taskforce will be established to provide guidance to this process and if you are interested in serving on this taskforce, please let me know. The CCPM has already begun the process of becoming a fully bilingual organization and there will be certain synergies in the two organizations working on this together.

The 2011 membership dues renewal process is now underway. Members will either pay harmonized sales tax (HST) or GST on their dues depending on their address on the membership register. Late fees will be charged on all dues paid after March 26, 2011.

The second annual Winter School will be taking place at the end of January at Mont Tremblant, Quebec. The planning committee has been working very hard to develop a program that builds on the success of the 2010 school and once again the COMP Board has fully endorsed this initiative.

We are looking for nominations for the 2011 Gold Medal Award - the highest award given by COMP. I encourage you to nominate a COMP member who has made a significant contribution to the field of medical physics in Canada. Nominations are due on January 28th. As well, submissions for the Sylvia Fedoruk Prize in Medical Physics are due on March 7, 2011. Both awards will be presented at the COMP Awards Banquet which will be taking place as part of the joint COMP/AAPM ASM in Vancouver from July 31st to August 4th in Vancouver.

The next membership directory will be published in the Spring of 2011 once the membership renewal process is complete as this is when the membership contact information is the most up to date. This will be the last printed copy of the directory and future directories will be produced as a PDF document and posted on the website. The online version will be less costly to produce and more environmentally friendly.

We look forward to seeing you at the 2011 ASM in Vancouver. Details about the meeting will be posted as they become available.

Ms. Nancy Barrett

As always, please feel free to contact me at nancy@medphys.ca or Gisele Kite at admin@medphys.ca at any time with your feedback and suggestions.

(Continued from page 5)

please consider carefully potential nominees for this position. There are a number of significant activities being engaged by the Professional Affairs Committee (PAC) so, if you have interest in influencing the direction being taken by COMP, consider getting involved. Ideally there will be more than one nominee and, consequently, an election. The basic opportunity of an election is that the nominees can outline their priorities for the PAC, offering options that the members of COMP can actively partake in supporting. If you want to Chair a committee, by all means encourage nomination by letting your colleagues know of your interest. And even if you do not wish to Chair a committee, if you have interest in participating in any committee, new members are always being sought. Simply express your interest to me or the chair of the committee of interest. The more that everyone gets involved, the better the job COMP can do of representing your interests.

(Continued from page 6)

provinces, they will use CCPM certifi cation as evidence of clinical competency rather than inventing a new process.

Just as my son will probably have left the babysitting profession by the time licensure is adopted, I may not be around to see licensure of medical physicists in Canada. Unless there is some pressing political imperative, these initiatives can be slow to evolve.

(Continued from page 9)

Further Reading

A site that features poor human factors in design: www.baddesigns.com/elevator.html

Information on Warning Effectiveness: www.visualexpert.com

Design for way-finding: http://udeworld.com/dissemination/publications/60-wayfinding-design-process-general-design-issues.html

A conceptual view of human factors in relation to accidents and disasters: Kim J. Vicente (2006) The Human Factor: Revolutionizing the Way People Live with Technology. Routledge.

Accounts of technological disasters caused by incompatibilities between the way things are designed and the way people actually perceive, think, and act: S.M. Casey (1998) Set Phasers on Stun: And Other True Tales of Design, Technology, and Human Error. Agean.

CNSC Feedback Forum
Doorless treatment rooms: Design considerations

Mark Broeders – Accelerators and Class II Facilities Division, Canadian Nuclear Safety Commission
Alice Salway, PhD – Human and Organizational Performance Division, Canadian Nuclear Safety Commission

Introduction

Approximately one quarter of cancer clinics in Canada now have one or more doorless treatment rooms, since their introduction in 1997. The stated rationale for adopting a doorless design is usually threefold:

1. Increased patient throughput
2. Less down time due to mechanical door problems

Reduced physical strain for the radiation therapists

The *Class II Nuclear Facilities and Prescribed Equipment Regulations* provide specific requirements for entrance interlocks for doorless treatment rooms:

15(3) Each entrance, other than a door, to a room in which Class II prescribed equipment is located shall be equipped with a device that stops the equipment when a person passes through the entrance

In all Class II facilities, the "door" interlock represents the last line of defence to protect public and staff from an unintended exposure. However, the interlocks themselves are invisible to a person entering the room and thus do not intrinsically deter someone from entering the room. Consequently, additional design features must serve to ward off unintended entry, prior to triggering the door interlock. This is especially important for doorless entrances.

Some design features are mandated, such as warning lights (*Class II Regulation* 15 (5)) and signage (*Radiation Protection Regulation* 21(b)). Other design features are not explicitly regulated by the CNSC. Provided that the door interlock is functioning as designed, the safety risk due to radiation exposure would be minimal. Nevertheless, triggering a door interlock is disruptive from a patient care point of view and is distracting for staff, which in turn can impact on safety.

Some design considerations for doorless treatment rooms are presented in this article. The need to validate systems that are used to warn of dangerous radiation is discussed. Approaches for the design of new facilities and modifications of existing ones are suggested.

The purpose of this article is to share some insights based on observations of many of these facilities, coupled with the expertise of the CNSC's in-house human factors specialists, who understand how people interact with their environments. This article should not be considered a change in regulatory expectation but simply a thought-provoking aid for those involved in treatment room design. It is hoped that increased awareness of human factors will lead to improved design of new or renovated facilities.

Design Considerations

Warnings have to be noticed and correctly interpreted

The first consideration involves ambient lighting. In at least two centres it was discovered, post-construction, that the warning lights were washed out by the bright light from nearby skylights, rendering the warning lights useless during the daytime. In the example illustrated in Figure 1, the lights inside the entrance are clearly visible, whereas the lights over the door are not.

Provided that the illuminated lights can be seen, the next issue is whether they are noticed. People rarely look up, and the best placement of a warning light or sign is slightly below eye level.

An effective warning needs to be correctly interpreted by the intended audience. In most cultures red is the sign of danger, so a red warning light similar to Canadian is good choice, although the meaning of the red light may be unclear to the public. As shown in Figure 2, one centre installed supplementary

Figure 1: Status of the upper warning light above door is uncertain due to nearby skylight (source: CNSC file)

pedestrian crossing signals. Even this solution may not be fully understood because the symbols are used in an unfamiliar context. It is good practice to provide text to explicitly indicate the nature of the hazard and the desired action of the reader, in addition to using warning lights or icons.

A rotary beacon or flashing warning attracts people's attention to the light. The frequency of the flash or rotation needs careful consideration in the context of the activities carried out nearby, given its potential to cause distraction and annoyance. Rotary beacons are less annoying than flashing lights.

Auditory warnings can also be used. One centre has used supplementary arrays of light curtains (via active sensors) to trig-

ger an early-warning chime to deter further progress into the maze, prior to walking through the door interlock light curtain that stops the equipment. This is intended to alert the wanderer, as well as to alert the nearby operator to the intrusion. The effectiveness of this measure is unknown, but it is likely that the public would not understand the purpose or meaning of the chime.

Figure 2: Use of pedestrian crosswalk-style warning lights (photo courtesy of Esmaeel Ghasroddashti)

Physical barriers in the 'doorless' design

Historically, treatment room doors were considered integral to the radiation shielding design. The trend towards doorless designs has eliminated the physical door, replacing it with an open maze corridor to provide shielding. However, the door served as a useful physical barrier to deter unintended entry to the room. Unshielded doors or some other physical barrier could be put in place to deter entry. Figure 3 shows an example of a warning tape barrier, used in addition to a door for a brachytherapy treatment room.

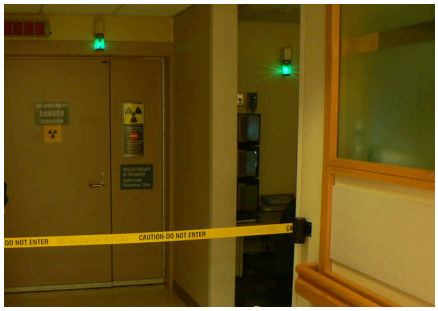


Figure 3: Supplementary warning tape style barrier (Source: CNSC file)

The entrance should not appear to be public space

In many cases the entrance appears to be a continuation of a public corridor, where there is little delineation of public and non-public space. If the entrance looks and feels like a public corridor, people will interpret it as such and they may not perceive the warning lights or signs. Bright, bunker entrances with artwork, co-ordinated colour schemes and uninterrupted construction materials (floor, walls, and ceiling) make the treatment room entrance seem inviting for patients and non-patients alike. The use of contrasting construction materials in the entrance could better delineate the treatment room entrance from the public areas.

The change of floor covering from the public space to the maze corridor can provide haptic feedback (through the sense of touch), that 'this space is different' as well as providing visual feedback to this effect.

In one centre, the designers linked the lights at the treatment room entrance to the warning lights, such that when the beam was 'ready' or 'on', the lights at the entrance to the room were turned off, making it less inviting for wanders. However, the safety aspects of the low light levels also need to be considered.

Facility layout and pedestrian traffic flow

Long, straight hallways that end at the treatment room door seem to invite wandering persons. Convoluted corridors can also invite wanderers, especially when the treatment room separates people from their intended destination. In one clinic, the layout of the centre has a popular coffee shop on the far side of the treatment room, relative to the waiting area. Based on their spatial reasoning, people in the waiting room try to find the shortest path to the coffee shop, which would be through the treatment room. The treatment room entrance thus invites people to use it as a shortcut. People choose to take what they perceive to be the easiest and shortest route, as evidenced by earth footpaths worn across grass in parks and other public spaces. Solutions to the shortcut problem could include clear directional signage showing the route to coffee shop, starting from the waiting area, in combination with other deterrents. Pedestrian traffic flows can be analysed when a building is designed or modified to identify potential problems, which can be removed or mitigated in the design.

Validation of warning systems

A warning system cannot be considered successful until it is proven effective in performing its function. Warnings need to be tested, especially where there is a significant risk, or for warnings that are novel. Deterrents to unintended entry to treatment rooms should also be tested where possible, and their effectiveness can be monitored by recording the instances of unintended entry to the treatment room. Human factors professionals can assist with warning development and testing, using their specialized knowledge and methodologies.

Conclusion

The design considerations included in this article are intended to assist treatment room planners and they *complement* the mandatory regulatory requirements for facilities regulated by the CNSC.

There is no universal solution for the problem of unintended entry to doorless treatment rooms and the solutions presented in this article may not work in all contexts. Single solutions are unlikely to be effective. Typically there will be a variety of possible solutions which will need to be applied in combination.

For a new facility or an expansion project it is beneficial for the architect to consider human factors issues and to have expertise in this domain. This enables design solutions to be developed for the particular context, including testing during the design development to identify and fix any problems. For an existing doorless treatment room, a human factors professional can provide specialist insight to develop customized design solutions to discourage unintended entry.

Ultimately, a balance must be found between aesthetic design that makes the clinical experience less intimidating for the patient, yet effectively conveys the intended message to staff and public. This article was intentionally written with a bias towards the latter with little consideration for aesthetics, in order to better demonstrate the options available.

We encourage *Interactions* readers to share their experiences, both positive and negative, regarding the use of doorless bunkers in the cancer clinic.

(Continued on page 7)

Harold Johns Travel Award Announcement
Deadline for Application: 8th April 2011

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 approximately two 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.

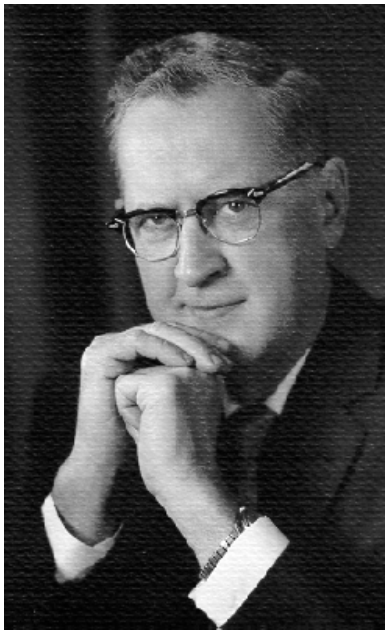
Successful candidates will have two years after their application deadline to complete their travel. They will be required to submit a short report to the Inter*ACTIONS* newsletter. The award recipient will be chosen by a committee consisting of the Chairman of the Examining Board, The Registrar and 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:
Mr. Darcy Mason, Registrar
Canadian College of Physicists in Medicine
c/o Durham Regional Cancer Centre,
1 Hospital Court,
Oshawa, ON L1G 2B9

damason@lakeridgehealth.on.ca

Contributions to the HE Johns Fund



CCPM wishes to recognize and thank the following members for their 2010 donations to the Harold Johns Travel Award. The list below has been updated to reflect all contributors this year. For many years the HE Johns Travel fund has been awarded to young medical physicists to support their travel to another center so that they may gain further experience in their specialty. With the economic downturn, investment return is minimal. Donations to the fund have to sustain the annual expenditure in the current economic environment. Please consider donating to the fund this year so that we may continue this legacy of education. Further details on the award can be found on the CCPM website.

The 2010 award winner is Dr. Kristin Marchant of Allan Blair Cancer Centre in Regina, Saskatchewan. She was hosted by the Medical College of Wisconsin in Milwaukee, Wisconsin, to learn about advanced techniques for brachytherapy planning using CT and MRI. The award may also be used in part to support her attendance at the ABS GYN Brachytherapy school.

HE Johns—Officer of the Order of Canada, Ph.D., LL.D., D.Sc., Emeritus University Professor and Professor Emeritus in the Department of Medical Biophysics and Radiology, University of Toronto

Dr Johns was born of missionary parents while in West China. During his scientific career, he published over 200 peer-reviewed papers, trained over 100 graduate students, many of whom hold key positions in the field of Medical Physics across Canada and around the world. He has won many prestigious awards and has published four editions of "The Physics of Radiology", the premiere textbook in the field.

His developments in the late 1940's of the Cobalt 'bomb' led to a new career in the pioneering field of Medical Biophysics. This in turn led to international reputation among scientists. His many awards and accolades reflect the respect and admiration in which he was held by academics and scientists around the world. He was inducted into the Canadian Medical Hall of Fame in 1998. Dr Johns passed away on August 23, 1998.

Generous Donors to the HE Johns Fund for 2010

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Conrad Yuen

The Simcoe Muskoka Regional Cancer Program- Physics Service

a collaboration between ***Sunnybrook Health Sciences Centre*** *and the* ***Royal Victoria Hospital***
is currently recruiting

MEDICAL PHYSICISTS

The Simcoe Muskoka Regional Cancer Centre (SMRCC) is seeking dynamic and motivated individuals as full-time ***medical physicists. The successful candidates will function*** under the leadership of the Odette Cancer Centre, Sunnybrook Health Sciences Centre (Sunnybrook). Physicists will work at the SMRCC in Barrie. The city of Barrie is located in the heart of Ontario's cottage and ski country and is 45 minutes north of Toronto.

The SMRCC is targeted to open in late 2011, and projected to treat approximately 1400 new patients annually with radiation therapy. This state of the art radiation treatment facility will be equipped with 3 new Varian Clinac *iX* linear accelerators, each having VMAT, IGRT and respiratory gating capabilities, one which will have stereotactic capability. A Philips Brilliance CT Simulator with Varian's Advanced RPM system will provide both 3D and 4D treatment planning data. The paperless environment will be supported by Varian's ARIA Oncology Information System. Equipment commissioning is scheduled to begin in the spring of 2011.

Already recognized as innovative, in April 2008, the collaboration of RVH and Sunnybrook opened the award winning "First in Canada" temporary radiation treatment unit. This enabled radiation therapy services a full three years in advance of the opening of the SMRCC.

The Odette Cancer Centre is a comprehensive cancer centre and a major academic program of Sunnybrook, fully affiliated with the University of Toronto. Its radiation program has 13 state-of-the-art linear accelerators (Elekta and Siemens) including one Tomotherapy facility. Planning equipment includes 3 wide-bore CT simulators, 1 PET/CT simulator, Pinnacle, MMS, Plato, Oncentra, and XPLAN planning systems. The medical physics department currently includes 15 physicists, 12 engineering technologists, physics and computer support personnel, residents and graduate students.

The successful candidates will be responsible for clinical duties which may include: acceptance and commissioning of equipment, quality assurance, physics support for both external beam consultation with dosimetrists and physicians, new technique and protocol development, and staff education. The majority of this work will occur in Barrie, and medical physicists will have opportunities to participate in educational and research activities located at the OCC. In addition, this partnership will allow medical physicists the opportunity for academic appointment with the University of Toronto's Department of Radiation Oncology. The CAMPEP-accredited physics residency program at OCC offers excellent teaching opportunities.

QUALIFICATIONS:

- MSc. or PhD. in Medical Physics.
- Successful completion of a medical physics residency program is preferred.
- CCPM, ABR or equivalent would be considered an asset.
- Excellent written and oral communication
- Strong interpersonal skills and the ability to work well within an inter-disciplinary team and a changing environment.

APPLICATIONS: Resumes should be submitted to:

Kathy Mah, FCCPM
Deputy Head, Medical Physics Department
Odette Cancer Centre
Sunnybrook Health Sciences Centre
2075 Bayview Avenue, T Wing, Rm. TG 217
Toronto, Ontario M4N 3M5
CANADA
Email: kathy.mah@sunnybrook.ca

The Radiation Exposure Monitoring (REM) Project

Patricia Oakley
National Research Council Institute for Information Technology
Fredericton, NB

The National Research Council of Canada (NRC), Agfa HealthCare Inc., Hamilton Health Sciences Corporation and Medical Imaging Informatics Research Centre at McMaster University (MIIRC@M) have signed a collaborative agreement to begin a Dose Registry and Radiation Exposure Monitoring (REM) project.

This REM project will provide critical data that will help health-care professionals track radiation exposure in patients undergoing medical exams such as CAT Scan (CT) and other forms of diagnostic imaging. It will help to develop an IEA standards-based, scalable decision-support platform for physicians to ensure patient safety when prescribing treatments. The registry will also support a wide range of scientific studies on the short term and long-term effects of radiation on human health. In the long term the project will assist in creating an innovative national radiation-exposure registry.

Specific outcomes of the project will include:

- Data Collection Tools for existing PACS, radiology information systems and existing dose repositories;
- A Clinical Radiation Dose Registry that will track radiation exposure from diagnostic imaging procedures and collect real-time data over the long term, serving as a tool for researchers across Canada; and
- A Decision Support Platform that will provide up-to-date bench-

(Continued on page 16)

Impressions of the 31st Annual Conference of Association of Medical Physicists of India

Orest Ostapiak
Juravinski Cancer Centre
Hamilton, ON

Mid-November is the best time to visit India. This is particularly true when you are hosted by the Department of Radiotherapy at the Sanjay Gandhi Postgraduate Institute of Medical Sciences in Lucknow. There were five of us from Canada who had the privilege to speak at the 31st Annual Conference of Association of Medical Physicists of India held there.

One morning I had the pleasure of sharing a ride from our luxury hotel to the campus with Michael Brada from the Royal Marsden in London. He summed up my impression of India best by saying, "You can spend a week in Switzerland and have trouble writing a postcard, but if you spend a day in India, you can write a novel". In lieu of the novel, I have prepared the following brief summary.

Business first. The conference ran from Thursday to Sunday opening with an inaugural address that outlined the challenges of caring for a vast population with a shortage of facilities, difficulty training and retaining staff while maintaining viable research programs. The conference opened with a memorial lecture by Dr. A.S. Pradham (the editor of the Journal of Medical Physics) on advances in thermo and optically stimulated luminescent dosimetry in clinical applications. David Jaffray launched session 1 on IGRT with a thought-provoking overview of targeted therapy approaches using nanotechnology. He speculated on future applications of radiation sensitizers (such as gold nanoparticles) delivered via radiation sensitive liposome molecules which naturally accumulate in tumours. He envisions a dual role for gold nanoparticles: both for image guidance and for radiosensitization.

Several sessions were dedicated to the major sponsors (Eleckta, Varian, Accuray, Nucletron and Siemens) allowing vendor representatives to present their latest technological advances. Other sessions focused on dosimetry, computational modelling and brachytherapy. The popularity of volumetric arc-based techniques was evident as many presentations compared these newer techniques to conventional IMRT. One particularly significant session addressed the need to assess technological innovation using relevant endpoints. Importance of skills development in parallel with technological development was stressed.

Many of the sessions focused on quality assurance aspects of treatment verification and delivery. Tony Popescu's lucid presentation of his Monte Carlo based Rapid Arc treatment verification scheme generated much interest as did Jatinder Palta's recount of his a priori determination of dose uncertainty in IMRT planning and delivery. These two massively useful quality control initiatives are likely to gain wide acceptance.

Numerous highly regarded physicists and radiation oncologists from across India and the world presented on a wide variety of topics from Brachytherapy to Proton therapy. The high caliber scientific program alone made the trip half-way around the world worthwhile, but there were other aspects to the meeting that made the visit equally compelling. One cannot help but marvel at the problems plaguing this populous country and behold in awe the dedication and hard work of those impassioned few who work tirelessly at their art and science amid this impoverished backdrop.

(Continued on page 16)

CURRENT CORPORATE MEMBERS
JUNE 2010

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md@donaldsonmarphil.com

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www.elekta.com

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www.harpell.ca

Contact: Ron Wallace
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www.modusmed.com

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NELCO

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www.nelcoworldwide.com

Contact: Amy Dragani
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Nucletron Corporation

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www.nucletron.com

Contact: Victoria Younes
Vicki.younes@us.nucletron.com

Philips Healthcare

Phone: 1-877-744-5633
www.philips.com/healthcare

Contact: Leanne Buck
Leanne.Buck@philips.com

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Phone: 516-827-3181
www.ptwny.com

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ScandiDos Inc.

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Contact: Carrie Dugai
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TomoTherapy Inc.

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Contact: Kristi McCarthy
kmccarthy@tomotherapy.com

Varian Medical Systems

Phone: 702-938-4748
www.varian.com

Contact: Rosie Dinh
rosie.dinh@varian.com

The COMP Gold Medal

The COMP Gold Medal will be awarded to a member of COMP (or retired ex-member) who has made an outstanding contribution to the field of medical physics in Canada. An outstanding contribution is defined as one or more of the following:

- 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
- Leadership positions in medical physics organizations which have led to improvements in the status and public image of medical physicists in Canada
- Significant influence on the professional development of the careers of medical physicists in Canada through educational activities or mentorship

The Gold Medal is the highest award given by the Canadian Organization of Medical Physicists and will be given to currently active or retired 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 generally be given more than once per year.

Nominations for the 2011 medal are hereby solicited. Nominations are due by January 28, 2011 and must be made by a member of COMP. Nominations must include:

- the nominator's letter summarizing the contributions of the candidate in one or more of the areas listed above;
- the candidate's CV;
- the candidate's publication list (excluding abstracts) which highlights the candidate's most significant 10 papers;
- additional 1 to 2 page letters supporting the nomination from three or more members of COMP.

The applications will be made electronically to Nancy Barrett at the COMP office (preferably in pdf format, nancy@medphys.ca) and authorship of the submission e-mail will be verified by the COMP Office.

A committee of COMP members appointed by the COMP Board will consider nominations and recommend award winners to the COMP Board by March 30, 2011. The COMP Board makes the final decision and the awardee will be notified by April 30, 2011 to give time to arrange to be at the joint COMP/AAPM annual meeting which will be taking place in Vancouver from July 31 – August 4, 2011.

Candidates selected for the medal will be invited to attend the annual meeting where the award will be presented by the COMP President. Travel expenses will be paid for the medal winner. The medal winner may be asked to give a 30 minute scientific presentation at the COMP meeting in addition to a short acceptance speech when the medal is presented.

Dr. B. Gino Fallone is Knighted!

Colin Field and Alasdair Syme
Cross Cancer Institute
Edmonton, Alberta

Dr. Gino Fallone (Cross Cancer Institute, Edmonton, Alberta) has received the distinction of "Cavaliere Ordine al Merito della Repubblica Italiana" or "Knight of the Order of Merit of the Italian Republic".

The Italian Cultural Society in collaboration with Italian Community

Associations sponsored the Festa Italiana d'Autunno on Saturday October 23, 2010. During the celebration, the Console General from Vancouver, Francesco de Conno presented Gino with this distinguished award, consisting of a number of commemorative medals and a certificate signed by the President of the Italian Republic.

The gala event was attended by about 200 guests including Gino's immediate family, his brother and sister-in-law from Montreal, colleagues from the CCI, Alberta Cancer Foundation, and Alberta Cancer Board (now part of Alberta Health Services) and representatives from 14 Italian communities from the Edmonton area. Entertainment was provided by talented individuals from Edmonton, Calgary and the Italian Appennini Dancers. Gino's award was reported in the Edmonton Journal on Sunday, October 24 in Nick Lees' column which can be found at http://www.edmontonjournal.com/Olympian+training+World+Greatest+Crawl/3718203/story.html#ixzz13UOwXOtq

A social gathering was held Tuesday October 26, 2010 at the Cross Cancer Institute to celebrate Gino's receipt of this prestigious award. Dr. Anthony Fields (named one of Alberta's 100 Physicians of the Century in Alberta's centennial year) and Dr. Jack Cunningham (received the Order of Canada in 2005) were guest speakers who entertained about 100 well-wishers. The cake cutting was performed with a knife befitting a knight.

Congratulations to Cavaliere Dr. B. Gino Fallone !!!

(Ostapiak: Continued from page 13)

After the final session, I spent some with two physicists from Bangladesh touring the renowned sites of Lucknow with our hosts, Maria Das and Suresh Kumar. As time went on, the sightseeing became secondary distraction as the sense of humour and levity shared among the group brought tears of laughter to our eyes and left us all with indelible memories of good times shared together.

In trying to explain India to my wife, I became philosophical: If you narrow your focus you will see the 1% of India that is spectacular, but if you broaden your perspective, you will see that 100% of India is beautiful. There is beauty in people's kind tolerance of stray animals, in the frenetic pace of traffic as synchronized and chaotic as teaming schools of fish, in rows of bicycles stored unlocked in racks, and in the communities of Muslims, Hindus and Christians liv-

(Oakley: Continued from page 13)

marking reports, personal and population dose profiles, to promote the effective use of diagnostic imaging procedures.

A multifaceted design approach will utilize expertise in diverse areas such as semantic web, data mining, and user-centered design. In order to ensure that the developed prototype will meet the needs of the user community an advisory panel of clinical and scientific experts has been established to provide advice in the design and validation of the technology. The advisory panel includes representation from across Canada and includes representatives from the radiology, radiology technologist and health authority communities.

The project commenced in October 2009. The first prototype is scheduled to be completed by the fall of 2011.

For further information about the project please contact
Patricia Oakley
(patricia.oaklet@nrc-cnrc.gc.ca)
Or Sharon Wahl
(Sharon.wahl@nrc-cnrc.gc.ca)

2011 Sylvia Fedoruk Prize in Medical Physics

The Saskatchewan Cancer Agency is pleased to sponsor a competition for the 2011 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 jointly with the American Association of Physicists in Medicine from July 31 to August 4, 2011 in Vancouver, BC.

The 2011 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 2010 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 should be submitted electronically to:

Nancy Barrett
Executive Director
Canadian Organization of Medical Physics
E-mail: nancy@medphys.ca.

Each paper must be clearly marked: “Entry for 2010 Sylvia Fedoruk Prize” and must reach the above address no later than **Monday, March 7, 2011**. The award winners from the last five years were:

B. Gino Fallone, "First MR images obtained during megavoltage photon irradiation from a prototype integrated linac-MR system”, *Medical Physics 36 (6), 2084-2088 (2009).*

Karl Otto, “Volumetric modulated arc therapy: IMRT in a single gantry arc”, *Medical Physics 35, 310-317* (2008)

Magdalena Bazalova, Luc Beaulieu, Steven Palefsky, Frank Verhaegen, “Correction of CT artifacts and its influence on Monte Carlo dose calculations”, *Medical Physics 34, 2119-2132 (2007)*

Brian Nieman, Ann Flenniken, S. Lee Admanson, R. Mark Henkelman, John G. Sled, “Anatomical Phenotyping in the Brain and Skull of a Mutant Mouse by Magnetic Resonance Imaging and Computed Tomography”, *Physiol Genomics **24**:154-162* (2006)

Guy-Ann Turgeon, Glenn Lehmann, Gerard Guiraudon, Maria Drangova, David Holdsworth, Terry Peters, “2D-3D registration of coronary angiograms for cardiac procedure planning and guidance. *Medical Physics, **32**(12): 3737-49* (2005)

Please welcome the following new members who have joined COMP since our last issue:

Last Name	First Name	Institute	Membership Type
Bjarnason	Thor	Vancouver Coastal Health	Full
Davis	Stephen	McGill University Health Centre	Full
Hobson	Maritza	McGill University Health Centre	Full
Sham	Edwin	Nova Scotia Cancer Centre	Full
Pandeya	Ganga Dhar	University Medical Centre Groningen	Student
Renaud	James	McGill University	Student
Shao	Peng	University of Alberta	Student

Letter to the Editor

Reading my October, 2010 issue of Interactions, I was pleased to see CCPM President Dave Wilkins in his Message acknowledge the awarding of the William D. Coolidge Award to Carleton University physicist Dave Rogers. Congratulations to Dr. Rogers on this most deserved achievement recognizing his career of productive research and development in medical physics.

In Dave Wilkins' Message, we see emphasis on the importance of medical physicists conducting research. From Dave Rogers' acceptance speech, "*We have to be doing research: it is research that sets us apart. Without a research component to every clinical physics position, we will soon find ourselves being replaced by radiation technologists making half the salary but doing a perfectly adequate clinical job with their strong physics background.*" And from Dave Wilkins, "*Without research, or at minimum an effort to contribute to the improvement of our craft, we risk losing scope of practice to others.*"

I have two points to make about the ideas quoted above. First, I agree that the concerns expressed by these medical physicists about potential loss of turf are perfectly valid. However, if one takes a broader view and asks not what is best for medical physicists as a professional group but rather how best to spend limited health care dollars, then the idea of "radiation technologists doing a perfectly adequate clinical job with their strong physics backgrounds while making half the salary" makes good sense! My question then is whether medical physicists can rise above self interest and recognize that a good chunk of our routine clinical work can and should be done by others at what truly is about half the price.

My second point begins with the recognition that radiation treatment and imaging technologies have evolved to a level of remarkable sophistication. I would argue that these technologies are getting asymptotic and could even be called mature. There is no doubt that hardware and software refinements will continue, but developments will be driven in good measure by equipment vendors. Yet in many cancer treatment centres, there remains a tacit assumption that every new physicist hire needs to be research active. If we're honest, this requirement usually is borne not of a burning need for cutting edge research to advance a rapidly developing field but rather of an insular desire to advance the prestige of a particular department and/or program, or to maintain the professional status of medical physicists.

There will in the foreseeable future continue to be a need for research trained medical physicists in the various subfields of radiation medicine. These individuals typically bring to the job a wealth of analytical and technical skills. Some even make good administrators! But I would argue that the traditional model that sees medical physics departments populated by clinical physicists sporting research programs like arm charms no longer is the best fit for our health care needs. I see it changing slowly in places, and this is a good thing not to be feared.

Douglas R. Wyman, PhD, FCCPM
Department of Medical Physics
Juravinski Cancer Centre
and Hospital
Hamilton, Ontario

Request for Proposal: COMP Annual Scientific Meeting Local Arrangements Committee

The Canadian Organization of Medical Physicists (COMP) is seeking proposals from groups interested in serving as the Local Arrangements Committee (LAC) for the COMP Annual Scientific Meeting (ASM) for 2014.

BACKGROUND

The COMP membership meets formally once a year, usually in mid-June. Proffered papers on various topics of current research and clinical interest are presented. This is an opportunity for the members to network and keep abreast of colleague's activities. It is also a venue to formally discuss issues of concern to the membership. COMP attempts to ensure that the ASM's are geographically dispersed as much as possible. We also attempt to hold stand-alone meetings at least every second year. The following locations have been confirmed for future ASM's:

2007 – Toronto (joint with CARO)
2008 – Quebec City
2009 -- Victoria
2010 – Ottawa
2011 -- Vancouver (joint with AAPM)
2012 – Halifax
2013 – Montreal (joint with CARO)

SCOPE OF REQUIRED SERVICES

The LAC is required to do the following:

- Work with the Executive Director to select appropriate meeting space for the ASM and accommodations for the delegates
- Work with the Conference Committee to develop the theme for the ASM and program schedule
- Work with the Executive Director to develop a detailed budget for the ASM and manage all related financial transactions
- Plan and execute all social/networking activities
- Coordinate onsite registration
- Coordinate audio visual requirements
- Coordinate the printing of the ASM proceedings
- Following the ASM, present a final report to the Conference Committee which reconciles all financial transactions, outlines what worked well and makes suggestions for improvements. This report will serve as a resource to future LAC's.

INFORMATION REQUIRED

Proposals shall be in a word file of no more than three pages and forwarded by e-mail to nancy@medphys.ca.
Proposals should include the following:

- Information about the organization and capabilities of the prospective LAC
- Information about the medical physics community in the proposing city
- Information about prospective venues for the meeting
- A preliminary budget (templates are available)
- Information on similar events hosted

COMP reserves the right to:

- accept a proposal without negotiation
- negotiate changes to the successful proposal
- cancel or reissue this RFP at any time

The COMP contact for the purposes of response to this request for proposal is:
Nancy Barrett
Executive Director
nancy@medphys.ca

TG-142 vs CAPCA: a head-to-head comparison of quality control guidelines for IMRT medical linear accelerators

E. Ghasroddashti and C. Kirkby[a)]
Jack Ady Cancer Centre, Lethbridge, Alberta
Department of Physics and Astronomy, University of Calgary

P. Dunscombe
Department of Medical Physics, Tom Baker Cancer Centre, Calgary, Alberta
Department of Physics and Astronomy, University of Calgary

Dr. Esmaeel Ghasroddashti and Dr Charles Kirkby, the Medical Physicists at the Jack Ady Cancer Centre (JACC) in Lethbridge Alberta who performed the commissioning of the this new center.

Introduction

The commissioning of the Jack Ady Cancer Centre in Lethbridge, Alberta warranted a review of recent quality control standards as we put in place a quality assurance program for our two linear accelerators. The first step in this effort was a direct comparison of two prominent standards. Our analysis may be of interest to other centres during revision of their own quality control programs and hence we summarize our observations here. On a practical level, the identified tests, the frequencies at which they are performed and acceptable operational tolerances are based on estimates of risk. These are largely a matter of expert opinion and thus it is not surprising to find differences in different sets of standards.

In 2009, the AAPM Task Group Report 142 (TG-142)[1] released an update to the guidelines for quality assurance on medical linear accelerators previously established by Task Group Report TG-40.[2] The new report updates recommended tests and frequencies, adds recommendations for asymmetric jaws, multileaf collimation, dynamic/virtual wedges and also incorporates new technologies such as respiratory gating systems. We take this as the first set of standards and compare it with a set of standards defined by the Canadian Association of Provincial Cancer Agencies (CAPCA). Several years ago, CAPCA initiated a process by which quality control standards could be standardized across Canada and released a series of documents detailing their recommendations. As this second set of standards we take together the CAPCA standards for Medical Linear Accelerators, Multileaf Collimators, Electronic Portal Imaging Devices, and the draft documentation for Linac Integrated kV Imaging System and CBCT Simulators.[3]

Here we examine the relevant standards as they apply to IMRT, non-stereotactic machines, noting that the TG-142 report applies different standards to IMRT, non-IMRT and stereotactic machines. Noting that adding up the numbers is tricky because there is not necessarily a one-to-one correspondence between the standards investigated, a total of 212 tests are identified. We compare TG-142 and CAPCA with respect to the

TG-142		CAPCA	
Test	**Freq**	**Test**	**Freq**
Dosimetry			
Electron output constancy	W	Output constancy - electrons	D
X-ray beam quality (PDD_{10} or TMR^{20}_{10}) + Electron beam quality (R_{50})	A	CAX depth dose reprod	M
kV planar beam quality/energy	A	X-ray Generation : kV + HVL (for lowest & highest kVp settings clinically available for CBCT	S
X-ray flatness change from baseline	A	Beam flatness	M
X-ray symmetry change from baseline	A	Beam symmetry	M
Electron flatness change from baseline	A	Beam flatness	M
Electron symmetry change from baseline	A	Beam symmetry	M
Mechanical			
lasers vs front pointer	M	laser/crosswire	D
table angle	A	couch angle	M
MLC			
MLC qualitative tests (picket fence) + leaf position repeatability	W + A	verify data transferred vs printed template + leaf alignment	P + M
leaf position accuracy (different gantry angles)	M	leaf stability with gantry rotation	A
coincidence of light and rad field	A	light and rad field coincidence	M
Wedges			
WF all energies 45° or 60° + physical wedge transmission factor	M + A	dynamic wedge factors + wedge transmission factor reprod.	D + A
MV Imaging			
EPID positioning/repositioning	D	positioning perpendicular to imaging plane	M
Image uniformity and nose + spatial resolution	M	EPID image quality	D
EPID imaging/tmt coordinate coincidence (single gant angle) + (4 cardinal angles)	D + M	positioning in the imaging plane	M
kV Imaging and CBCT			
OBI/CBCT positioning/repositioning	D	OBI source (if adjustable) and det mechanical positioning test	M
OBI spatial resolution	M	radiographic: high contrast resolution	S
OBI contrast	M	radiographic: low contrast resolution	S
CBCT uniformity and noise	M	image uniformity (when CBCT images used for planning)	D
CBCT spatial resolution	M	volumetric: high contrast resolution full fan / half fan	
CBCT contrast	M	volumetric: low contrast resolution full fan / half fan	S
CBCT HU constancy	M	volumetric: CT # accuracy - other materials mean full fan / half fan	S

Table 1. A comparison of similar tests in the two standards occurring at different frequencies (D – daily, W – weekly, P – patient specific, M – monthly, S – semi-annual, A – annual).

specific recommended tests, their tolerances, and the recommended frequencies. In general there is a large degree of commonality between the two as one would expect. Here we concentrate on presenting the differences. We observe 23 cases of common tests that occur with different suggested testing frequencies (table 1), 32 tests unique to the TG-142 standards, and 24 unique to the CAPCA standards.

Highlighted Differences

Tolerances vs. Action Levels

The CAPCA documentation establishes tolerances and action levels as two thresholds specific for any measured parameter. No action is necessary when differences between measured and expected values fall below the associated tolerance. Immediate action is required when the difference falls outside of the action level. Intermediate results warrant responses reflecting the clinical situation at the time. The TG-142 report defines only tolerances and suggests a hierarchy of associated actions when measurements exceed tolerances. On a very general basis, the tolerances defined by TG-142 approximately correspond with the action levels established by the CAPCA standards although this is not always the case.

Test Definitions

In both cases, the standards themselves cannot be taken as comprehensive QC guides as the details of the measurements to be made are not always clearly specified. Additionally, the tests of each parameter can be performed using different approaches, with different equipment. Through test designators and associated notes, the CAPCA documentation mentions specific details for most tests that cannot be incorporated into tabular form. In contrast, the TG-142 report relies completely on supporting documentation for details of the performance of specific tests.

The beam profile tests provide a good example of differences in test definitions and highlight some of the difficulties of a direct, head-to-head comparison. TG-142 lists monthly profile tests as "photon beam profile constancy" and "electron beam profile constancy" whereas the CAPCA document lists "beam flatness" and "beam symmetry." TG-142 updates the TG-40 definitions used for these parameters, suggesting that the average percentage discrepancy from the baseline measurement be within a tolerance of 1%. The CAPCA documentation leaves the definitions of flatness and symmetry as more flexible, referring to the definitions used in "the initial purchase agreement."

(Continued on page 22)

TG-142 Exclusive Test	Tol./Act.	Freq.
stereotactic interlocks (lockout)	functional	D
EPID positioning/repositioning	2 mm	D
Typical dose rate output constancy	2%	M
wedge placement accuracy	2 mm	M
compensator placement accuracy	1 mm	M
latching of wedges/blocking tray	functional	M
laser guard interlock test	functional	M
MLC leaf travel speed	> 0.5 cm/s	M
Backup diaphragm setting (Elekta only)	2 mm	M
EPID scaling	2 mm	M
CBCT geometric distortion	2 mm	M
Beam energy constancy	2%	M
Temporal accuracy of phase/amplitude gate on	100 ms	M
Calibration of surrogate for respiratory phase/amplitude	100 ms	M
Interlock testing (resp gating)	functional	M
X-ray output constancy vs. dose rate	±2%	A
Arc mode (expected MU, degrees)	±1%	A
TBI/TSET mode	functional	A
PDD or TMR and OAF constancy	1% TBI 1 mm TSET	A
TBI/TSET output calibration	±2%	A
TBI/TSET accessories	±2%	A
table max range, all directions	±2 mm	A
full field wedge angle check (60) + spot check at other angles	2%	A
Follow manufacturer's test procedures	functional	A
MLC spoke shot	= 1.0 mm radius	A
Segmental IMRT (step & shoot) test	< 0.35 cm	A
Moving window IMRT (4 cardinal gantry angles)	< 0.35 cm	A
kV imager planar imaging dose	baseline	A
Beam energy constancy	2%	A
Temporal accuracy of phase/amplitude gate on	100 ms	A
Calibration of surrogate for respiratory phase/amplitude	100 ms	A
Interlock testing (resp gating)	functional	A

CAPCA Exclusive Test	Tol./Act.	Freq.
Couch brakes	functional	D
Beam interrupt/ counters	functional	D
EPID Mechanical integrity	functional	D
EPID Electrical integrity	functional	D
kV imaging beam status indicators	functional	D
kV imaging emergency off buttons	functional	D
Wedge tray cone interlock	functional	M
Emergency off	functional	M
Review of daily QA records (all systems)	complete	M
Digitizer check (MLC)	functional	M
monitor controls (EPID)	reprod	M
spatial distortion (EPID)	1 mm	M
artefacts (EPID)	reprod	M
KV detector and source axes coincident (isocentric) w gantry rot'n axis	1 mm / 2 mm	M
End monitor effect	0.1 MU / 0.2 MU	A
Accessory transmission factors reprod	1% / 2%	A
MLC leaf alignment with jaws	1 mm	A
X-ray Generation: Output linearity (in time & mA)	5% / 10%	S
radiographic: gray scale linearity	11 shades / 12 shades	S
radiographic: automatic brightness control (ABC)	2 / 3 kVp =3 / 4 sec	S
simulated planning	functional	A
spatial linearity verification	1% / 2%	A
slice reconstruction width verification	5% / 10%	A
independent quality control review (all systems)	complete	A

Table 2. Lists of tests exclusive to each standard. Those in grey on the TG-142 table indicate modalities not covered in the CAPCA documentation.

Frequency of Testing

In Table 1 we compare similar tests described in each set of standards where the frequency of measurement is different. In all, we found 23 pairs of similar tests but with different frequencies. Going back to the beam profile example, we note that TG-142 also incorporates tests for changes in flatness and symmetry from baseline measurements on both a monthly and an annual frequency, whereas the CAPCA testing is performed on a monthly basis only. As another example, many of the kV imaging system image characterisation tests are performed on a semi-annual basis in the CAPCA standards, but monthly in TG-142. Such differences reflect the different expert opinions of the writing committees who prepared the standards.

Exclusive Tests

In Table 2, we have identified tests in one document for which we could not find a specific counter part in the other– those that are exclusive to TG-142 are on the left and those exclusive to CAPCA on the right. Out of the 212 tests we found 32 exclusive to TG-142 and 24 exclusive to CAPCA, but there are a few important points to note.

The TG-142 report incorporates tests for new and/or alternative modes of linear accelerator operation, specifically total body irradiation (TBI), total skin electron irradiation (TSEI), arc mode, and respiratory gating. These modes of operation are not considered in the CAPCA documentation and account for 14 of the 32 TG-142-exclusive tests.

A common theme in the CAPCA documentation is record checking. On a monthly basis the CAPCA standards require review of daily records and on an annual basis an independent quality control review is required. There are no directly tabulated counterparts in the TG-142 report.

Another important point is the reflection of current clinical practice. The more recent TG-142 standards incorporate a patient positioning test for each imaging system on a daily basis – including the EPID. In the somewhat older CAPCA documentation, daily EPID testing has a stronger emphasis on image quality and does not include a patient positioning test. CAPCA does suggest daily patient positioning tests for the kV imaging system. With respect to MLC testing, the TG-142 report includes such tests as a daily picket fence image, a monthly leaf speed test and annual IMRT tests, whereas, in con-

(Continued on page 23)

One of the two Varian iX linear accelerator at the Jack Ady Cancer Centre (JACC) in Lethbridge Alberta.

trast, the CAPCA documentation lists only static tests for the MLC. Also of note, the TG-142 report includes an annual direction to follow the manufacturer's testing procedures.

Concluding Remarks

Ultimately a departmental Quality Assurance committee will integrate published standards along with the experience, knowledge base and specialized understanding of radiation therapy of its members, to create and maintain an effective quality control program relevant to the needs of its specific facility. This is an ongoing process that requires periodic review, especially as new technologies are incorporated into the clinic, and we hope that this review will be of assistance to anyone tasked with this process

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Report from the IEC Subcommittee 62/Working group 2 Meeting September 6-8, 2010, Barcelona, Spain

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One of the most important tasks for the medical physicist working in a clinical environment is to ensure flawless functioning of the medical equipment. In nuclear medicine, this involves continuous monitoring of the performance of a SPECT and/or PET cameras, which recently are very often supplemented by a CT system. Depending on the objectives, the extent and scope of the quality control tests vary. After camera installation, the broadest and most complete QC assessments or acceptance tests are done to ensure the correct performance of the system, verify its compliance with the published (or manufacturers') specifications, and establish the benchmark conditions for all future measurements. Later, over a camera's entire period of clinical operation, hospital technicians and/or physicists regularly perform various QC tests - some daily, others weekly, monthly, or yearly. Obviously, in order to allow the user to compare the performance of different systems and/or follow the changes over time, the methodology how these tests are performed and the data analyzed must be standardized.

The International Electrotechnical Commission (IEC) with headquarters in Geneva, Switzerland, is the organization that prepares and publishes international standards for all electrical, electronic and related technologies. (The corresponding standards organization for all other products and systems is the International Organization for Standardization – ISO). IEC's mission is to promote, through its members, international cooperation on all questions of electrotechnical standardization and related matters such as the assessment of conformity to standards in the fields of electricity, electronics, and related technologies. In particular, in 1968 the IEC Subcommittee 62 was established with a task to prepare international standards and technical reports concerning the manufacture, installation and application of electrical equipment used in medical practice and their effects on patients, operators and the environment.

Other sets of standards (and these may be better known in America) are published by the National Electrical Manufacturers Association (NEMA). NEMA is the leading trade association in the US representing the interests of electroindustry, so it cannot be considered an independent body. Therefore, the standards published by IEC supersede NEMA and are recognized by several countries in the world, including all European Union countries, Canada and USA. NEMA participates extensively in the IEC at both technical and management levels and provides the Secretariat support for six IEC Technical Committees (TCs).

I have been involved in quality control of nuclear medicine cameras at the Vancouver Coastal Health and other hospitals in British Columbia and Canada for the last twenty years and over time acquired good understanding of the tests and related issues. Additionally, I have presented a number of talks, seminars and short courses about QC testing. Therefore, I was not very surprised when last year I got an invitation to join the Standards Council of Canada (SCC) and get involved in the works of IEC as a Canadian representative. Canada participates in IEC through SCC and this summer I got an official accreditation from SCC to attend the IEC Subcommittee 62 meeting in Barcelona.

As IEC does not provide any funding for the meeting participants, at this point I would like to kindly acknowledge the support which I got for this trip from the SCC office and from Canadian Organization of Medical Physicists. I am very grateful for this support, without it I would not be able to attend the meeting.

The meeting was held on September 6-8, 2010 at the Hospital Universitari de Bellvitge in Barcelona, Spain. There were eight participants to the meeting coming from USA, Germany, Spain and Canada (Bernd Knoop, James Halama, John Williams, Bernd Seidel, Rafael Puchal, Hertwig Newiger, Charles Stearns and Anna Celler) and representing both clinical physics and camera manufacturers.

The objective of the meeting was to establish the new and final version of the IEC 61675-11 document which summarizes what is to become the standard testing conditions for the modern PET and PET/CT cameras. The special emphasis in the discussions was on a precise (and easy to understand for a non-native-English audience) formulation of the QC test objectives, the description of the required phantom geometries and experimental conditions, the

(Continued on page 25)

processing and analysis of data and finally, reporting of the results. The old version of the IEC 61675-11 served as a draft working document. The references to the NU 2-2007 NEMA pamphlet were often made and the descriptions of tests in the IEC and NEMA documents were compared.

Following the mandate of IEC SC62 which is to keep the standards in-line with the most recent developments of the equipment, the new standard document recognises that:

"Further developments of POSITRON EMISSION TOMOGRAPHS allow most of the tomographs to be operated in fully 3D acquisition mode. To comply with this trend, this standard describes test conditions in accordance with this acquisition characteristic. In addition, a today's POSITRON EMISSION TOMOGRAPH often includes a computed tomograph (CT). For this standard PET/CT hybrid devices are considered to be state of the art, dedicated POSITRON EMISSION TOMOGRAPHS not including the X-ray component being the special cases only".

It would probably be boring and not appropriate to report here all the details of the discussions which took place during these very long three days of meeting. The discussion often focused on creating the most correct update to the current document (which was designed for the old systems) to take into account changes made in the newer systems, often operating in 3D mode.We covered all aspects of PET quality control tests, discussed at lenght implementation of PET quantitative corrections: for randoms, attenuation, scatter, dead-time, branching ratio, radioactive decay, and sensitivity calibration aiming at expressing images in activity units (Bq). Then, the discussion moved to the system resolution measurement: how to measure FWHM, were to position the sources and how the profiles should be determined in order to obtain consistent FWHM, how many data points in the profiles are required.

Regarding the topic of tomographic sensitivity, the relative merit of using five aluminum sleeves versus single polyethylene cylinder was discussed. The measurement using sleeves does not depend on the density of aluminum as only the thicknesses of sleeves must be consistent. On the other hand, since attenuation correction is not applied in this test, if the density of the polyethylene tube deviates from the specified, the results of the sensitivity measurement may be wrong. The length of the line source to be inserted into the phantom should be equal to the length of the phantom (70cm) not longer. A separate issue is the number of counts which need to be collected for this test. For 3D systems due to variation in detection efficiency many more counts will be collected in the central slices than at the edges, thus collecting 200 000 in each slice will not be possible. We decided to change the required minimum to 10 000 counts per slice, which will result in 1% error at the edges, while the central slices will have much better statistics.

Then, the conditions for the PET count rate characteristics test were established and substantial changes in wording of the current document were proposed. Discussion of the test for scatter fraction determination was focused on the width of the strip over which the scatter fraction has to be calculated. The tests for image quality and quantitative accuracy determination were substantially simplified as it was felt that the current requirements were too cumbersome and time consuming while not very informative. Six fillable hot spheres and one cold cylinder modeling lung tissue will be used in the torso phantom with 4:1 object to background ratio. No spine or other dense material will be required. Regarding combined PET/CT studies, the co-registration of images is considered to be one of the most important problems. Co-registration of PET and CT should be done by comparing centroids of thresholded spheres. The total displacement distance will be calculated.

Additionally, there was a discussion of the mandate of the IEC tests and differences between IEC and NEMA. IEC tests must be simple, relevant to patient conditions and indicate what would be the performance of the system when it is used in patient studies. **The objective of IEC is the characterization of the imaging system and creating a class standard that not necessarily should be used to test every particular camera, but rather would help to compare different classes of systems.** It was noted that unfortunately the IEC documents have been used in different countries to create a standard set of acceptance tests although task groups exist in NEMA to create the appropriate standards by simplifying SPECT and PET acceptance tests so that they can be used exactly for such purposes.

At the end of the meeting, every chapter of the document was assigned to a different panel member for a careful review, to check the document consistency and to correct wording. It was agreed that the next version should be ready for the final review by all IEC SC62 members on November 15th, 2010.

And finally, the time and location of the next meeting were decided. It will be held in Vancouver, on the 26 -29 April, 2011 and I will be its organizer and a host.

Editor's Note

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GE Healthcare recently announced the introduction of model-based image reconstruction algorithm for computed tomography. The algorithm is available in Europe and is expected to become available in North America soon. This was personally meaningful to me because my PhD dissertation was on such algorithms and part of it was in collaboration with GE. GE had begun back in the day to look at alternatives to good-old filtered back projection (FBP).

In the world of CT imaging we are no longer seeing the "slice wars" between vendors, but the "dose wars", and for good reason. CT is the major contributor to radiation dose in medical imaging and its use is steadily rising. In an attempt to reduce the dose, vendors are turning to iterative algorithms. Most vendors are really offering some form of image restoration, not true iterative reconstruction. In their purest form, iterative algorithms are based on models of noise statistics and imaging physics. At any one iteration, the current image (or solution to the estimation problem) is used to synthesize data based on physical and statistical models. For example, in my PhD work, I focused on including beam hardening physics and Poisson statistics. This synthetic data is then compared to the actual acquired data and if necessary, an update to the image is calculated. The potential of such model-based algorithms lies in the fact that they offer a superior noise/resolution trade off to FBP. Clinically, this means that superior image quality could be achieved at the same dose or equivalent image quality at lower dose. Reports in the literature suggest that dose reductions between 20-30% are possible. These dose savings could increase with fully model-based algorithms.

As usual, vendors are throwing at us a plethora of acronyms with little actual scientific explanation of their respective implementation. This is where Medical Physicists can add tremendous value by offering our clinical stakeholders and clients objective assessment and clear explanation of the real science behind the glossy pamphlets. It is tough to stay abreast of all the technological developments, but in my view, this is part of the real value of medical physicists. One could argue that it does not take a graduate-trained medical physicist to perform some of our quality control tasks, but on the other hand no one can provide the depth of understanding that we bring to these tasks, and it such depth of understand that we must always develop and project.

Dates to Remember

Inter*ACTIONS* Spring Issue Deadline is March 1, 2011!

COMP Gold Medal Award Nominations January 28, 2011

COMP Winter School, January 30 - February 3, 2011, Mont Tremblant, QC

Sylvia Fedoruk Prize Submissions March 7, 2011

Late Fees for COMP Dues March 27, 2011

SPIE Medical Imaging February 11-17, 2011 Orlando, FL

Joint AAPM/COMP Annual Meeting July 31 - August 4, 2011 Vancouver, BC

Medical Physicist Dave Jette to Lead a Mountain Adventure

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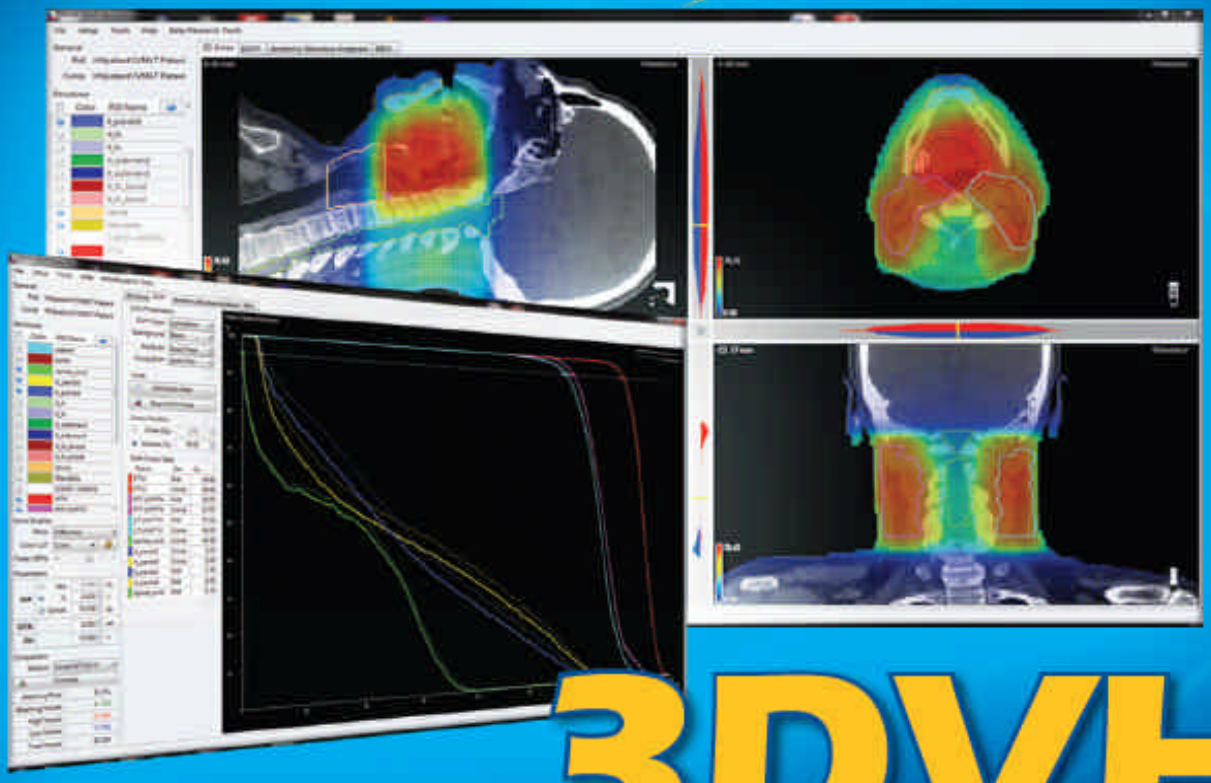

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