Medical Physics in Canada: Historical perspective

Medical Physics has a long and illustrious history in Canada. Many physics departments across the country had already contributed during the 1930s and 1940s to efforts in making the use of ionizing radiation in medicine safe and efficient. There were many pockets of significant early contributions to medical physics spread across Canada; however, none of them were as important, far reaching, and visionary as the program developed by Harold E. Johns. His first job was with the University of Saskatchewan and the Saskatchewan Cancer Commission in Saskatoon. While in Saskatoon in the late 1940s and early 1950s, he invented the cobalt-60 teletherapy machine for cancer therapy, built the first such machine, and developed a first class medical physics graduate program. This program trained many graduate students who upon graduation made significant contributions to medical physics in their own right and now form the links in Johns's medical physics dynasty now already extending into four generations.

In mid 1950s Johns moved to Toronto accompanied by some of his former students. Together they built the Princess Margaret Hospital (PMH) into one of the pre-eminent, world-renowned centers for medical physics. When he retired in 1980, the PMH and the imprint of Harold Johns largely identified and defined Canadian medical physics. His medical physics textbook "The Physics of Radiology" that he co-authored with John R. Cunningham went through four editions and is still considered one of the most important and complete medical physics textbooks.

The year 1980 was a watershed year in Canadian medical physics. Not only did Johns retire; several other important events took place during that year that shifted the focus of the Canadian medical physics from the PMH and spread it over several other centers across Canada: (1) the Canadian College of Physicists in Medicine (CCPM) was formed; (2) several new clinical centers were established and many older centers were expanded or rejuvenated; (3) several new graduate education programs in medical physics were inaugurated; and (4) the x-ray section of the National Research Council (NRC) in Ottawa was reorganized and its dosimetry work expanded.

After 1980 medical physics research spread rapidly to major provincial centers across Canada, and in radiotherapy physics the PMH was no longer the sole contributor to medical physics research in Canada. Imaging physics also underwent a major expansion, most notably with the opening of the "Robarts Research Institute" in London, Ontario and the "Reichman Research Institute" in Toronto, both staffed with many eminent medical physicists who proved that radiotherapy physics was not the only exciting and important branch of medical physics.

In the latter part of 1980s many senior medical physicists actually believed that imaging physics was a place to be because radiotherapy physics was a completed discipline with exhausted research opportunities. However, the early 1990s proved them wrong with the explosion in radiotherapy physics research engendered by rapid advances in treatment planning, in technology of dose delivery, and in imaging for radiotherapy. The advent of the CT-simulator, intensity modulated radiotherapy, and image guided radiotherapy has increased significantly the complexity of dose delivery, highlighting the importance of medical physics in imaging and treatment of cancer. In recent years the new technology has caused convergence of imaging and radiotherapy physics and introduced the PET functional imaging to radiotherapy. It also opened

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Medical Physics in Canada: Current Status

Canada has always been strong in medical physics and this tradition continues. The main characteristics of Canadian medical physics are: a high level of professionalism; strong national medical physics organizations; a certification process run by medical physicists for medical physicists; excellent graduate and residency teaching programs spread across Canada; excellent research productivity; and concentration of clinical and academic programs in larger centers.

With the increased sophistication of technology used in medicine, especially in radiotherapy and imaging, the need for medical physics services is growing rapidly. The current number of over 500 practicing medical physicists in Canada has essentially doubled from 250 that were active 15 years ago. The two national medical physics organizations in Canada are the Canadian Organization of Medical Physicists (COMP) and the Canadian College of Physicists in Medicine (CCPM). COMP deals with all issues relevant to medical physicists, such as annual meetings; young investigator symposia; liaison with international medical physics and medical organizations; sponsorship of medical physics journals; and collection of membership dues. The CCPM, on the other hand, representing 300 Members and Fellows, deals only with professional issues, such as: certification of medical physicists; accreditation of medical physics education programs; maintenance of certification; and continuing education.

The “Medical Physics” journal is the official science journal of the American Association of Physicists in Medicine (AAPM) but is also sponsored by the COMP and the CCPM. The mean annual ratio between the number of articles published in “Medical Physics” and originating in Canadian institutions to the number of articles originating in American institutions is about 1 to 5. Based on the population ratio of 1 to 9 between Canada and the U.S., the ratio of 1 to 5 in published articles suggests a per capita rate in Canada almost double that in the U.S. and attests to the excellent medical physics research productivity in Canadian institutions.

Another important characteristic of Canadian medical physics is its strong ties with the AAPM. The AAPM has over 6000 members, and some 350 of them work in Canadian institutions and participate on the AAPM Board of Directors and various AAPM councils, committees as well as task groups. It is also notable that to date Canadian medical physicists won 33 % of the Farrington Daniels awards (11 of 33) and 25 % of the Sylvia Sorkin Greenfield awards (6 of 25). The AAPM bestows the two awards annually for the best articles published in the “Medical Physics” journal, respectively, on the subject of radiation dosimetry and on any other medical physics subject except for dosimetry.

Among its other professional activities, the CCPM sponsors, as one of four sponsoring organizations, the Commission on Accreditation of Medical Physics Education Programs (CAMPEP). The other three sponsors of CAMPEP are the AAPM, the American College of Medical Physics (ACMP), and the American College of Radiology (ACR). The CAMPEP accredits four types of medical physics education programs: graduate M.Sc. and Ph.D. programs; residencies in radiotherapy physics; residencies in imaging; and continuing education programs. Similar to Canadian medical physics research, Canadian medical physics education programs also do quite well. Of the 20 graduate programs currently accredited by the CAMPEP, five (25 %) are in Canada; of the 27 accredited residency programs in radiotherapy physics, seven (26 %) are in Canada; and of the three accredited imaging physics programs, one is in Canada.

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