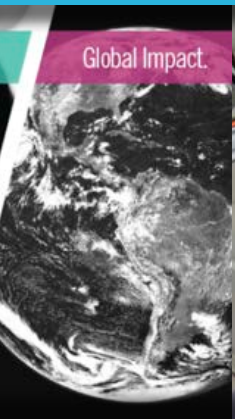
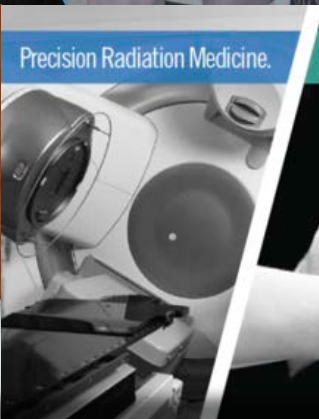




2015-2016 ANNUAL REPORT

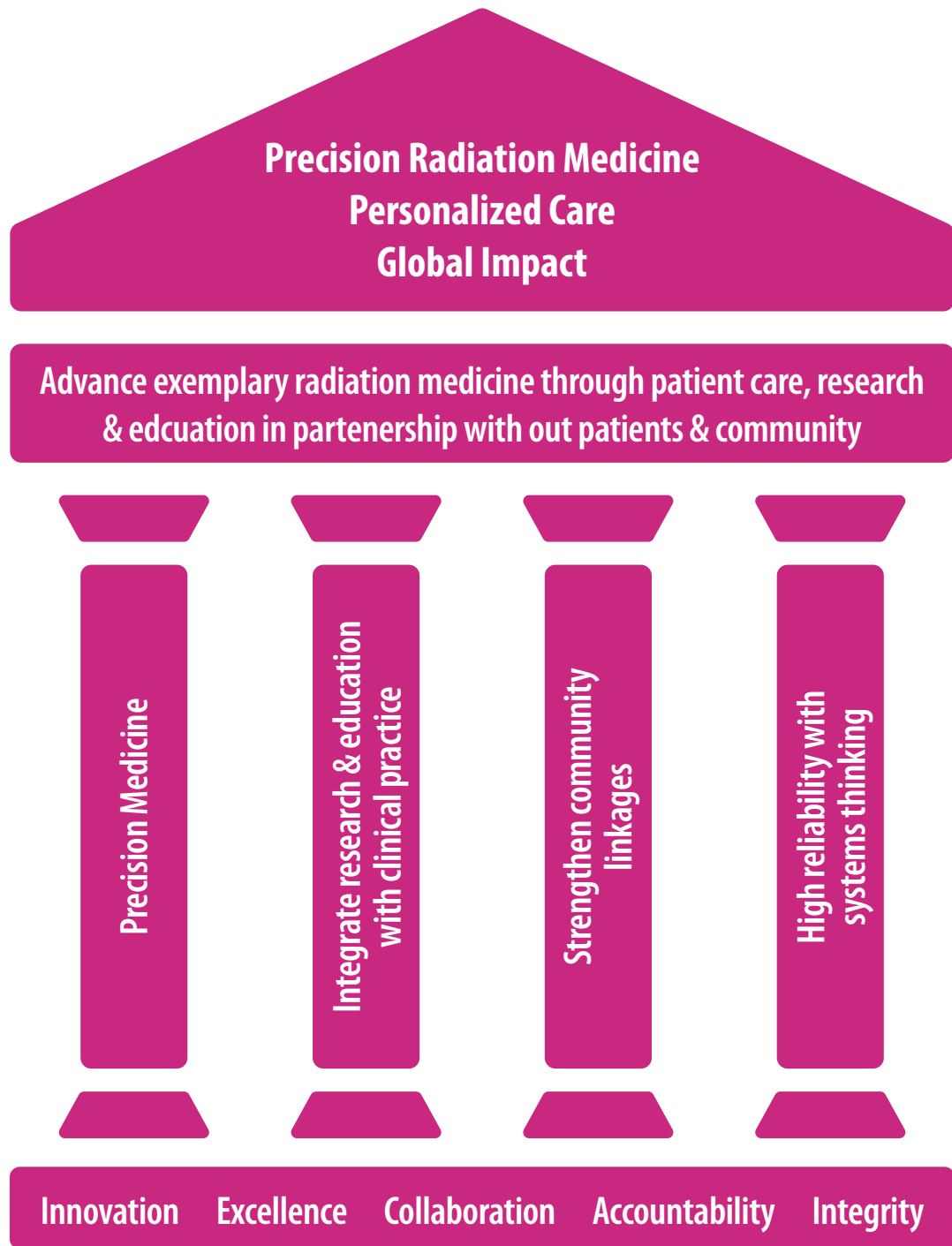


RADIATION MEDICINE PROGRAM



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THE CHIEF'S MESSAGE

The Radiation Medicine Program (RMP) at the Princess Margaret Cancer Centre is committed to providing the best care to our cancer patients. Over the past year, the hard work and dedication of our multi-professional team of radiation oncologists, radiation therapists, medical physicists and nurses, supported by the invaluable work of our administrative, clinical, technical, and support staff, has ensured that RMP maintained its position as the premier Radiation Medicine Program in the world.

A major highlight was the launch of our new Strategic Plan; *Roadmap to 2020* which redefines our program's vision, mission and core values. In addition, we developed our Year-1 implementation plan which will streamline and maximize efforts towards executing our strategic priorities. *Roadmap to 2020* resulted from a year-long process; building upon previous successes while preparing for the future of Radiation Medicine. It is aligned with the goals and priorities of the Princess Margaret Cancer Program and the University of Toronto, Department of Radiation Oncology, both of which are integral to our operations.

RMP continued its tradition of excellence and innovation in patient care, research, and education, recording the highest number of radiation courses delivered in the recent decade. Our multi-talented team was strengthened by the addition of new staff and leadership. We demonstrated our commitment to our cancer patients by developing innovative approaches to treat and improve care through research and system improvements, and continued to participate in the training of future leaders in radiation medicine through the delivery of innovative educational programs.

On behalf of the RMP, I am delighted to share our many accomplishments in research, education and innovation. I am immensely grateful for our dedicated team. Thank you to all RMP staff for your continued hard work and unwavering dedication to our patients, and to our vision. I look forward to us continually pushing the boundaries of innovation as we move together towards achieving our mission to **“advance exemplary radiation medicine through patient care, research and education in partnership with our patients and community.”**

Fei-Fei Liu, MD, FRCPC

Chief, Radiation Medicine Program, Princess Margaret Cancer Centre
Head, Department of Radiation Oncology, University Health Network

PROGRAM OVERVIEW

The Radiation Medicine Program at the Princess Margaret Cancer Centre (RMP) is the largest radiation treatment centre in Canada, and one of international acclaim. Inspired by our Vision of *"Precision Radiation Medicine. Personalized Care. Global Impact."* RMP endeavors to improve the quality of radiation therapy worldwide.

RMP is organized into the three core disciplines of radiation oncology, medical physics and radiation therapy, each supported by robust clinical, research, administrative and technical teams. Together, working in a state-of-the-art facility; this multi-professional group of over 350 staff work together to deliver high quality and safe radiation treatment to over 8000 cancer patients every year. Our research program spans from biological research, translational biology and physics, clinical trials, to health services and education, which aims to innovate and advance Radiation Medicine practice, producing over 200 peer-reviewed publications per year.

Our interdisciplinary environment facilitates an education program which covers the continuum of professional learning in Radiation Medicine; including training at the undergraduate, graduate and postgraduate levels in collaboration with affiliated universities, clinical training, and continuing medical education. RMP is also a provider of external peer learning through our Observership program and Accelerated Education Programs. To this end, many of our staff hold important education leadership roles at the University of Toronto which supports and synergizes the development and delivery of innovative education programs.

STATE OF THE ART FACILITY

16

Linear Accelerators

1

MR Simulator (3T)

1

Magnetic Resonance Guided Radiation Therapy (MRgRT) Facility

2

Perfexion (Gamma Knife) Units

1

Orthovoltage/ Superficial X-ray Unit

1

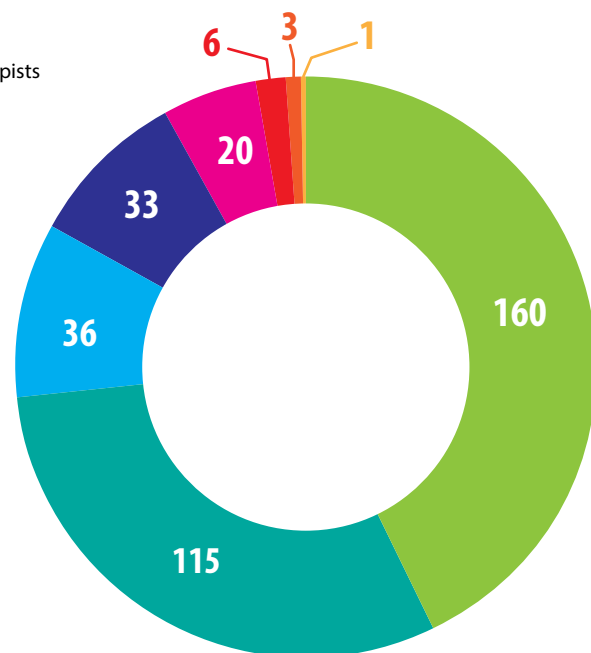
Brachytherapy High Dose Rate (HDR) remote afterloader

4

CT Simulators (1 with PET)

INTER-PROFESSIONAL TEAM

- Advanced Practice Radiation Therapists
- Nurse Practitioners
- Physician Assistant
- Radiation Therapists
- Support Staff
- Radiation Oncologists
- Medical Physicists
- Clinical Research Program Staff

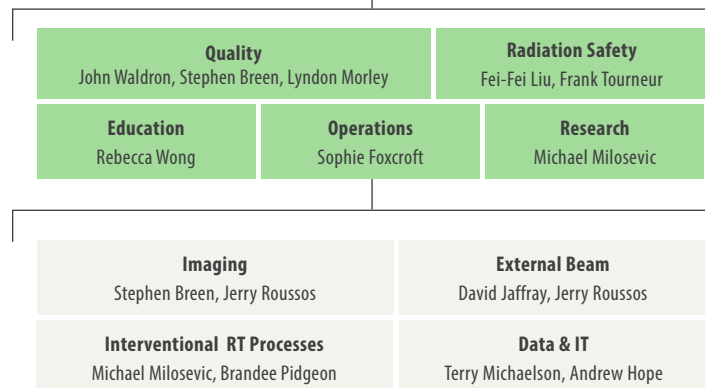


PROGRAM STRUCTURE

Our multi-talented, inter-professional staff enables all aspects of our program to succeed. Led by the program Chief, Dr. Fei-Fei Liu, the RMP Steering Committee defines the principles of operation, and policies of governance for the management of clinical, quality assurance and safety, research, educational, operational and IT activities.

Steering Committee

Chief	Fei-Fei Liu
Education	Rebecca Wong - Director
Operations	Sophie Foxcroft - Director
Clinical Programs	Andrea Bezjak - Director
Quality & Safety	Michael Milosevic / John Waldron* - Directors
Radiation Therapy	Elen Moyo - Director
Research	Michael Milosevic - Director
Medical Physics	David Jaffray - Head, Daniel Létourneau - Associate Head
Resource Allocation	Richard Tsang - Advisor
Manager	Catarina Lam



*Effective January 2016

THE YEAR IN NUMBERS



8,287
Patient Consultations*



228
Peer-Reviewed Publications



10,616
Radiation Treatment Courses*



26
Radiation Oncology Residents



400
Patients Treated Daily



24
Radiation Oncology Fellows



6,903
Patients Treated at the Radiation Nursing Clinic*



4
Medical Physics Residents



41M
in Peer-Reviewed Funding



45
Medical Radiation Sciences Students

*2015/16 fiscal year statistics for RMP



Precision Radiation Medicine.

Personalized Care.

Global Impact.

2015: LAUNCH OF ROADMAP TO 2020

2015 culminated with the launch of our new Strategic Plan: *Roadmap to 2020*. Roadmap to 2020 was developed following an extensive and iterative review of the 2011-2015 strategic plan, and builds upon the success of the previous plan in order to define the strategic priorities for the next 5 years. A plan for implementing Year-1 priorities was developed to ensure optimal execution. Implementation teams have been developed to move select initiatives forward, and ensure that progress toward realizing strategic goals is constantly being monitored by appropriate indicators.

IMPLEMENTATION PLAN

In 2016, RMP will begin initiatives aimed at executing our Year-1 priorities. Led by the Chief and guided by the Steering Committee, implementation teams will champion efforts toward achieving our Year-1 priorities as listed in the left hand column.

STRATEGIC PRIORITY	IMPLEMENTATION TEAM
1.0 Accelerate discovery to deliver precision medicine	Michael Milosevic*
Establish shared understanding of the meaning and scope of precision medicine	Michael Milosevic
Implement an adaptive radiation treatment strategy	Daniel Letourneau
Strengthen partnerships with research institutes & clinicians within UHN	Fei-Fei Liu
Expand patient engagement strategy to encompass clinical practice and research domains	Elen Moyo
Develop a business case and resourcing plan for a particle therapy facility	David Jaffray
Advance precision medicine by leveraging gains from personalized MR guided brachytherapy	Michael Milosevic
2.0 Integrate research and education with clinical practice	Rebecca Wong*
Refine point of care data capture processes	John Waldron
Establish site group research mandate plan	Richard Tsang
Establish a growth plan and business model for RMP continuing education offerings	Rebecca Wong
3.0 Strengthen internal and external community linkages	Sophie Foxcroft*
Facilitate staff access to UHN Wellness and Development programs	Elen Moyo
Monitor catchment areas for gaps and opportunities to facilitate access to care	Sophie Foxcroft
Revisit the RMP brand to enhance visibility within TC LHIN, the province and beyond	Andrea Bezjak
4.0 Extend high reliability with systems thinking	Daniel Letourneau and Sophie Foxcroft*
Establish KPIs and operational metrics to promote shared ownership across RMP	Daniel Letourneau
Review RMP Committees to optimize accountabilities and alignment with priorities	Sophie Foxcroft
Enhance RMP capacity and capability for quality improvement and project management	Catarina Lam

*Denotes the Executive sponsor/s and leader/s of the specified Strategic Priority

CLINICAL CARE

Our clinical practice encompasses all aspects of cancer care; from diagnosis to survivorship (ongoing follow-up care after cancer treatment). In 2015/16, RMP provided 8287 new patient consultations and delivered 10,616 courses of radiation treatment. The number of visits to the Radiation Nursing Clinic for symptom and side-effect management was also higher in 2015, at 6,903 visits.

Our clinical practice is integrated into four multi-disciplinary Superteams comprised of anatomically-related tumour site groups. Standardized treatment protocols that relate to evidence-based disease management guidelines are used by each site group to plan and treat patients.

In addition to site groups, a number of specialized programs exist to further support individualized care in a subset of patients. Together, our inter-professional team works collaboratively to assess, plan and deliver personalized care to our patients.

SUPER TEAMS

- TEAM 1:** Head & Neck, Endocrine, Skin, Eye
- TEAM 2:** Lung, Breast, Upper GI
- TEAM 3:** Genitourinary (GU), gynecologic, lower GI
- TEAM 4:** Central nervous system (CNS), lymphoma, leukaemia, sarcoma, paediatrics, palliative

TUMOUR SITE GROUPS

Breast	Gynecological (GYN)
Central Nervous System (CSN)	Head & Neck
Eye	Lung
Endocrine	Lymphoma & Myeloma
Gastrointestinal (GI)	Melanoma & Skin
Genitourinary (GU)	Sarcoma

SPECIALIZED PROGRAMS

Palliative Radiation Oncology	Brachytherapy
Oligometastases Program	Sterotactic Radiation Therapy
Pediatric Radiation Therapy	Gamma Knife Radiosurgery

HIGHLIGHTS



Enhancing Patient Education

In order to respond most effectively to the educational needs of patients undergoing external beam radiation therapy (RT) at RMP, radiation therapist **Christine Hill** led a quality improvement project entitled: *“Radiation Therapy Educational Resources: A Re-focus on Value to the Patient Experience”*.

With the support of the CAP Fellowship Program, this project surveyed 130 patients, 73 radiation therapists and 32 oncology nurses to identify gaps in the educational needs of patients in order to improve care. Findings indicated that staff and patient perceptions were not always concordant. For example, patients wished to be educated on treatment planning; what happens after radiation treatment; as well as information on other patients’ experiences. While radiation therapists and nurses considered it important for patients to have information about most topics, they had in fact rated treatment planning and other patients’ experiences lower than scored by the patients themselves. Both staff groups thought that patients were already overwhelmed with too much information, and did not read or want additional educational pamphlets. Hence, a gap was indeed identified.

The CAP Fellowship Program provides a unique opportunity to advance best practices in patient care in complex health environments by allowing health professionals working at the point-of-care to lead quality improvement projects. The results of this study will allow improvement in the timing and provision of educational materials provided to patients undergoing radiation therapy within RMP.

Christine Hill was awarded the UHN Collaborative Academic Practice (CAP) Health Professions Innovation and Research Fellowship Award and was accepted into the 2015-2016 CAP Fellowship program.



Magnetic Resonance Image-Guided Radiation Therapy

The first of its kind in Canada — the Magnetic Resonance-guided Radiation Therapy (MRgRT) facility at the Princess Margaret Cancer Centre integrates MR imaging with radiation therapy to enable more precise visualization of patients’ internal anatomy immediately prior to or after radiation treatments (near real-time). The MR magnet moves on a ceiling-mounted rail between the LINAC and high dose rate (HDR) brachytherapy suite, merging the imaging capabilities of a full-strength (1.5 T) open bore MR imaging system. Funded by the Canadian Foundation for Innovation (CFI) and the Princess Margaret Cancer Foundation (PMCF), this facility enables us to offer our patients unprecedented precision during treatment. So far, the MRgRT facility has delivered over 200 gynecology HDR brachytherapy courses, and the prostate interventional program successfully migrated to this facility in 2015.



Sandra Scott, 2015 Gerald Kirsh Humanitarian Award with Paula Kirsh

Extraordinary Patient Care

Radiation Therapist Sandra Scott was one of two recipients of the 2015 Gerald Kirsh Humanitarian Award. This award was established by family members of the late Mr. Gerald Kirsh who were inspired by the exceptional care they witnessed while he was being treated at the Princess Margaret. Now into its 16th year, the award recognizes UHN staff who have provided extraordinary patient care with a special human touch. RMP staff Kevin LeNeve (Radiation Therapist), Tatiana Ritchie (Radiation Therapist) and for the second consecutive year, John Waldron (Radiation Oncologist) were amongst the 18 nominees celebrated at this event.

QUALITY & SAFETY

RMP Quality Committee (RMP QC) functions to monitor, analyze, report on and make recommendations on all aspects of radiation treatment quality and safety within RMP. *RMP QC aims to exceed national and international safety standards* and oversees a quality monitoring program for the department covering the following four domains:

I. Quality Assurance and Compliance: Ensuring compliance with a variety of standards, guidelines and key indicators related to RMP quality and safety.

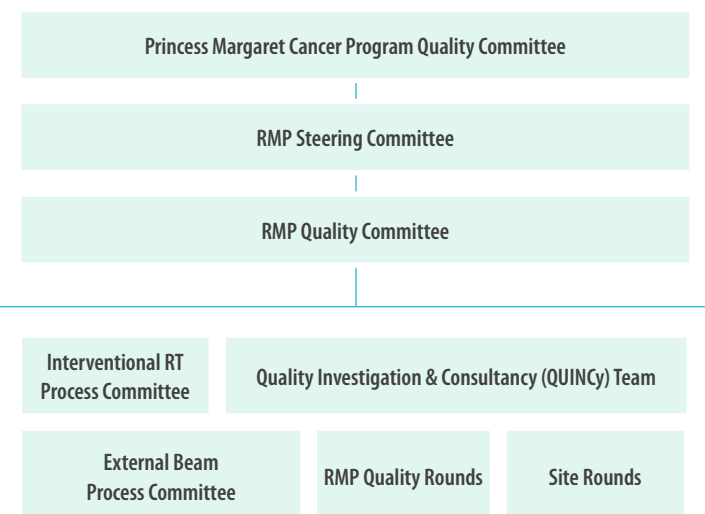
II. Quality Education: Improving quality and safety competence through education.

III. Incident Learning: Facilitating an incident learning system through reporting, investigation and analysis, and systems improvement.

IV. Quality Control and Improvement: Aimed at overseeing radiation treatment quality control processes and supporting continuous quality improvement.

QC REPORTING STRUCTURE

(in accordance with the Quality of Care Information Protection Act)



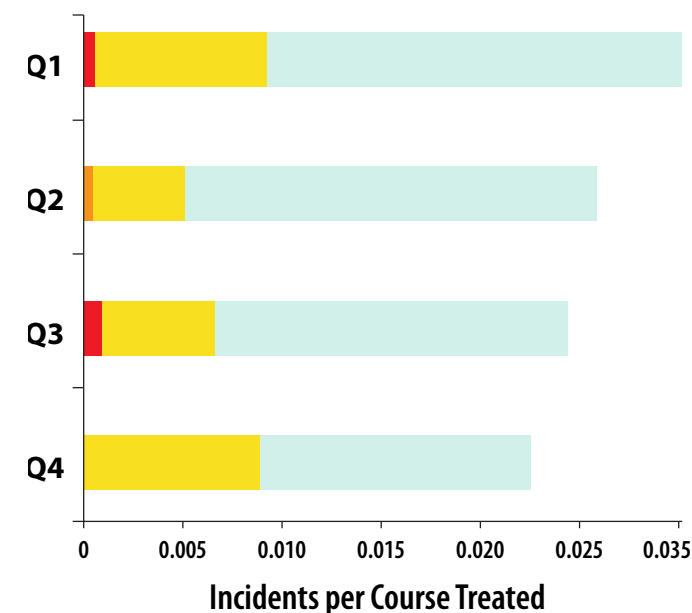
INCIDENT MANAGEMENT

QC INCIDENT REPORTING SYSTEM

RMP reporting system for incidents and near-misses includes a comprehensive incident review process to identify opportunities for system and programmatic performance improvement. There were no changes in the reporting rates of incidents and near-misses in 2015. A total of 188 incidents were recorded.

- Each quarter, a summary of radiation incidents is submitted to CCO Radiation Incident and Safety Committee (RISC). RISC has representation from all provincial cancer centres; in addition to monitoring incident rates, it also promotes sharing of information for learning and alerting to potential risks.
- A histogram of incidents and near misses per case of RT is submitted through the quality care committee structure to Princess Margaret Cancer Centre and UHN (see below). The RMP QC is currently developing a scoring system to assess whether incidents and near-misses require action plans by rating risk and action effectiveness.
- In line with UHN's reporting of never events, RMP plans to monitor "never events" that are reported in the incident data. These include:
 - Wrong site of radiation treatment
 - Wrong dose of radiation treatment
 - Patient or staff injury due to contact with radiation treatment equipment
 - Any dosimetric treatment error affecting a population of patients
 - Significant, unintended radiation exposure of a person at the radiotherapy facility

NUMBER OF INCIDENTS REPORTED



SEVERITY	
NEAR MISS	Near-miss: Incident occurred, but did not reach any person(s).
	Potentially severe: Incident occurred, but did not reach any person(s). Reach would have resulted in a severe or critical incident.
INCIDENTS	Minor: Incident occurred that reached the person(s) and caused minor harm or no harm.
	Moderate: Incident occurred that resulted in temporary harm requiring medical intervention. Incident did not result in prolonged hospitalization.
	Severe: Incident occurred that required an intervention necessary to sustain life, or may have contributed to permanent harm and/or prolonged hospitalization.

CONTRIBUTING TO RADIATION TREATMENT SAFETY AT THE NATIONAL LEVEL

During 2015, the RMP QC participated in the pilot implementation of the National System for Incident Reporting in Radiation Therapy (NSIR-RT). This voluntary reporting system which provides report-categorization taxonomy supports the collection, sharing and analysis of incident data to help identify how incidents occurred, and how similar incidents may be prevented.

Goals of the NSIR-RT

- Reduce variability in the type of information that is collected in incident reporting systems
- Communicate near-misses and errors in a timely manner so that RT programs across the country may benefit

RMP Quality Conference

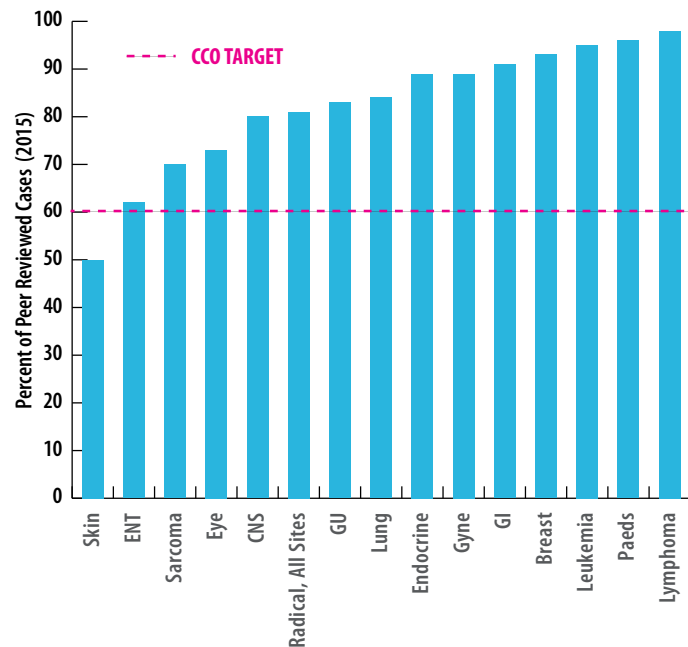
Monthly multi-disciplinary learning forum where quality and safety related topics are presented and discussed, making it an important component of the quality education portfolio. Conferences are recorded and accessible on the RMP network for viewing by staff who were unable to attend in person. The 2015 presentations covered a range of subjects including:

- Health Literacy
- Privacy and the Patient's Role in Safety
- Radiation Medicine Incident Learning System
- Quality in Competency, Competency in Quality
- Laterality Errors and Left-Right Cognition

QUALITY ASSURANCE AND COMPLIANCE

RMP QC Scholarly Activity: Three (3) RMP QC projects were presented at the 2015 Canadian Winter School on Quality and Safety in Radiation Oncology. "Implementation of a Data-Driven Peer Review Program" and "Tracking the Progress of Incident Learning in a Radiotherapy Department" were presented by Lyndon Morley; "Statistical Process Control to Monitor Incident Rates in Radiotherapy" was presented by Stephen Breen.

Treatment Plan Peer-Review is a CCO mandated safety indicator. The peer-review target for 2014/15 was 60% of all radical radiation courses prior to treatment start, or before 25% of the total dose has been delivered. For 2015/16 the target was increased to 75%. During 2015, RMP exceeded these standards in most sites, with nine out of fourteen site groups subjecting up to 80% of radical radiation courses to peer review (shown below). Overall data for the timeliness of peer review showed a steady increase over the last three years, resulting in more plans being reviewed prior to treatment start.



QUALITY IMPROVEMENT & INNOVATION



e-Consent: RMP Innovates to Improve the Quality of the Consent-to-Treatment Process

RMP staff Terry Michaelson (Director of Technical Systems), Veng Chhin (Team 4 Supervisor), Jerry Roussos (Practice Leader), and Mazaheer Bana (Technical Analyst) developed an electronic method of capturing patient consent (e-consent). e-Consent is a password-protected, internet-based, electronic application accessed by iPad air devices running the Filemaker Go v.13 app (free from iTunes app store) via UHN wireless protocols (Wi-Fi). It exists on the Filemaker Pro Server within the RMP IT infrastructure. After conducting a pilot study which demonstrated value in capturing consents electronically as opposed to using paper-based methods, e-Consent was deployed across the RMP in October 2015.

Created with the generous support of the Princess Margaret Cancer Foundation, this paperless technology was associated with significantly faster consenting, plus a major reduction in documentation errors. This development has significantly improved the consent-to-treatment process.

Rads4Kids App: Innovating for Pediatric Cancer Patients



Our pediatric patient population may have difficulty fully grasping the basics of radiation therapy, as well as what to expect during and after their treatment. To enable better communication with this patient population, a first-of-its-kind, interactive App termed *Rads4Kids*, was developed by a team of RMP and SickKids Hospital staff. Motivated by the goal to enhance the experience of pediatric cancer patients — Susan Awrey, oncologists Norm Laperriere, Barbara-Ann Millar and Dave Hodgson, as well as Ryan Hyvarinen simplified several aspects

of radiation therapy for Pediatric Cancer Patients and their parents by incorporating four (4) important features in the App.

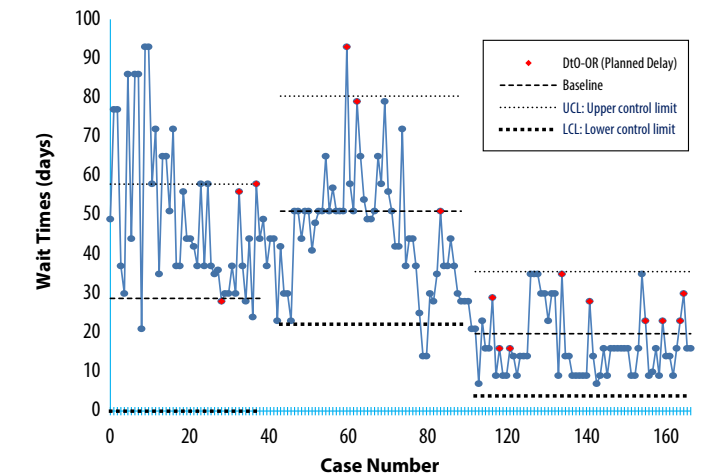
- FAQs which describe radiation side effects, signs and symptoms, and tools for helping pediatric patients cope with their treatment
- A game that illustrates radiation attacking bad cells in the body, demonstrating the benefit of RT
- A calendar of emoticons which allows pediatric patients to record how they feel
- A story book, available in French and English, which explains radiation therapy to children

Susan Awrey, the project's leader, believes that *Rads4Kids* offers patients and their families pertinent information regarding their care. Users do not require Wi-Fi to access the App once downloaded, and the generic nature of the technology ensures broad application to any radiation therapy facility. It has been used across Canada and in several countries worldwide with great success. *Rads4Kids* was funded by the Princess Margaret Cancer Foundation and is free to download.

Eye Plaque Wait Times

An assessment of ready-to-treat to treat wait times for eye patients undergoing brachytherapy eye plaque insertion revealed a gradual increase over the past 2 years to an interval that exceeded the national guidelines of 28 days. The data was shared with the site group which introduced a variety of strategies, including review of OR optimization and patient flow, in order to improve capacity and access. RMP was able to demonstrate improvement and monitor sustainability over time by using a control chart, ensuring that patients have ready access to this important treatment.

Control Chart of Wait Times for Eye Plaque Patients January 2015 and April 2016



EDUCATION

RMP is committed to training the next generation of Radiation Medicine professionals through the provision of high quality educational programs. As the largest single-site radiation medicine program in the world, RMP provides one of the most comprehensive clinical settings for the formal training of radiation therapists, physicists and radiation oncologists.

As a fully-affiliated teaching hospital of the University of Toronto, RMP's education portfolio is closely aligned with education programs of the Department of Radiation Oncology at the University of Toronto (UTDRO). This strategic alignment enables the optimal utilization of educational expertise and infrastructure, and facilitates the achievement of the central education mandate of RMP and UTDRO.

Our programs encompass all aspects of professional learning in radiation medicine, from the undergraduate to postgraduate level. Current programs include; undergraduate training for radiation therapy (BSc. Medical Radiation Sciences), MHS (Medical Radiation Sciences) and the Excellence in Radiation Research for the 21st Century (EIRR21) Scholars program, an interdisciplinary research training program for graduate students, postdoctoral fellows, and clinical fellows in radiation medicine. Postgraduate programs include training for Radiation Oncology Residency, Radiation Oncology Fellowship and Medical Physics Residency. Faculty also provide teaching of residents and fellows from other training programs, as well as supervision to Masters and PhD students as part of the graduate programs with the Institute of Health Policy, Planning and Evaluation, the Dalla Lana School of Public Health, Nursing, Institute of Medical Sciences, and Medical Biophysics at the University of Toronto.

Building upon our highly sought after training programs, we provide learning opportunities for radiation medicine practitioners through the Accelerated Education Program (AEP). Bringing together our best teachers and innovative pedagogy, the AEP focuses on multidisciplinary learning. Implementation of Cisco Show-and-Share Platform provides enhanced capability to record and build educational assets. RMP also provides opportunities for practicing radiation medicine professionals to experience our culture and expertise through an observer-

ship program. Motivated by our desire to share our expertise to reduce the global gap in access to radiotherapy, 2015 was a landmark year for RMP, during which we continued to participate in educational initiatives which have far reaching contributions globally.

DIVERSE LEARNERS

UNDERGRADUATE

- 45 Students enrolled in the BSc in Medical Radiation Sciences
- 21 Summer Students
- 2 CARO-CROF students
- 8 Physics students
- 11 Clinical and research laboratory opportunities

GRADUATE

- 24 Excellence in Radiation Research for the 21st Century (EIRR21) Scholars

POST-GRADUATE

- 4 Medical Physics Residents
- 24 Radiation Oncology Clinical Fellows
- 26 Radiation Oncology Residents

CONTINUING EDUCATION

- 59 Observers from 17 countries
- 5 Observers from China & Spain for the Executive Personalized Learning Program™
- 4 On-site AEP Course listings
- 93 AEP participants

ACCELERATED EDUCATION PROGRAM FACTS

NUMBER OF PARTICIPANTS PER COURSE

- 28 SBRT for Metastases: Oligometes & Beyond
- 26 Liver SBRT IGRT
- 17 Accelerator Technology (ATec)
- 22 Quality & Safety in Radiation Therapy (QSRT)

NEW COURSE LAUNCHED IN 2015

SBRT for Metastases: Oligometes & Beyond

There was a 19% increase in the number of external AEP participants in 2015



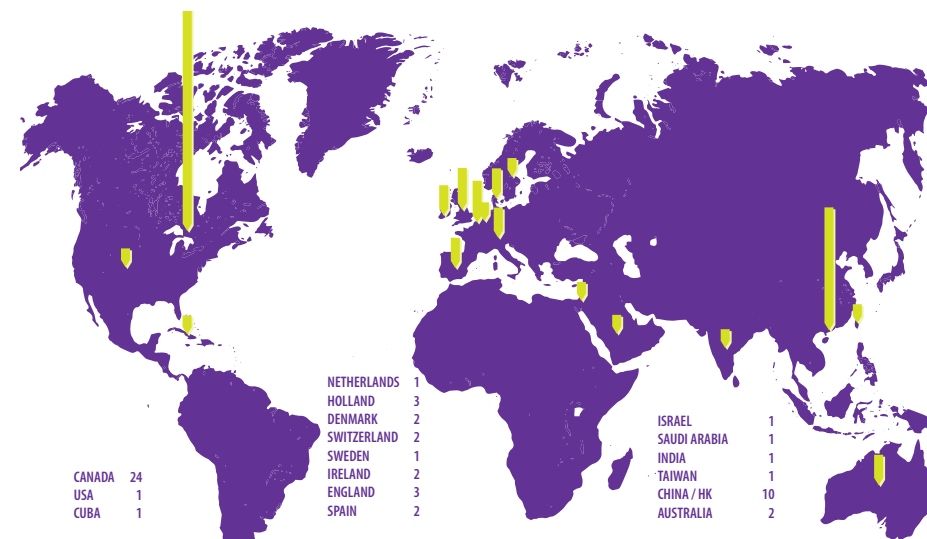
Jean-Pierre Bissonnette's contribution to the Physics Residency Program

Jean-Pierre Bissonnette completed 7 years as the Director of the Physics Residency Program. He has played a significant role in the development and advancement of over 60 Medical Physicists in the province of Ontario. In addition, his research has led to improved quality and safety in radiation therapy for our cancer patients, as well as innovative educational offerings for the Physics program. We are very fortunate and grateful for the critical work that Dr. Bissonnette has done in enhancing teaching and learning for our students, improving quality in the area of radiation therapy and establishing the Medical Physics program into one of lasting global impact. Andrea McNiven has now taken over this important role.

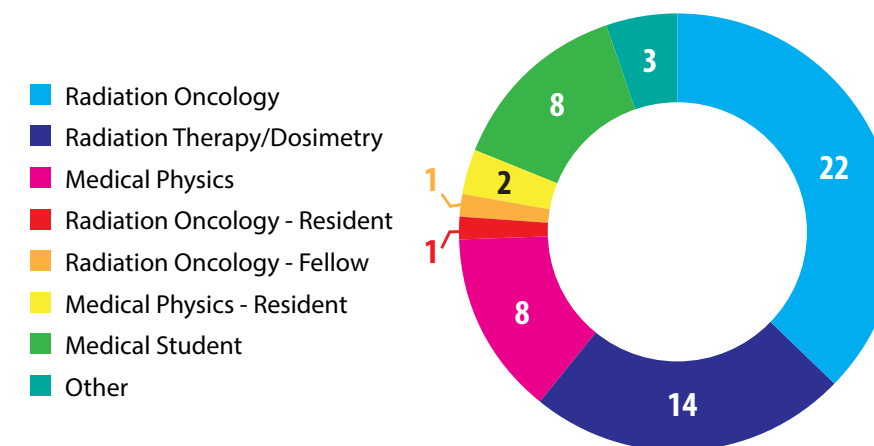
RMP OBSERVERSHIP PROGRAM

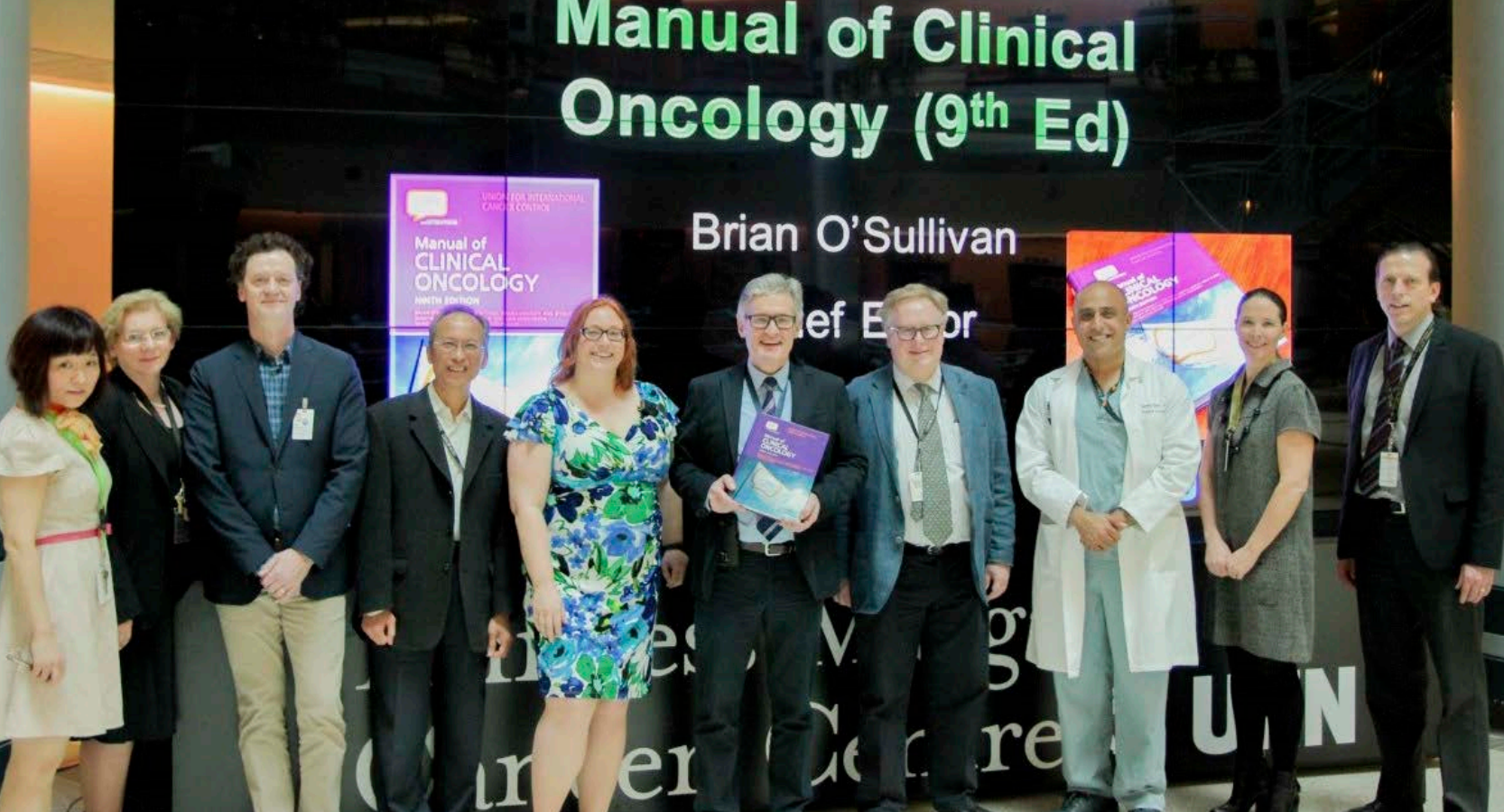
In 2015, RMP hosted 59 observers from 17 countries; a record number for the program. Observers spent a median of 4 days (Range 1-54) at our department. A more streamlined and transparent administrative process has been developed, with the goal of optimizing our observer's experience with minimal interruption to our clinical workflow.

OBSERVERSHIP PARTICIPANTS' COUNTRIES



OBSERVERSHIP PARTICIPANTS' CAREERS





GLOBAL CAPACITY BUILDING THROUGH INNOVATIVE EDUCATIONAL PROGRAMS

HIGHLIGHTS

Worldwide Launch of the 9th Edition of the UICC Manual of Clinical Oncology

The Ninth Edition of the *Union for International Cancer Control (UICC) Manual of Clinical Oncology (MCO)* was launched in October. Led by RMP's Brian O'Sullivan (Editor-in-Chief), this Edition reflects a 3-year global collaborative effort by acknowledged experts in Oncology. In addition to Dr. O'Sullivan, the editorial team included James Brierley (Editor), and Sophie Huang (Editorial Coordinator). Other contributors from RMP were Mary Gospodarowicz (Prognosis and Classification of Cancer and Principle of Cancer Staging), David Jaffray (lead author of Cancer Informatics), Richard Tsang (lead author of Lymphoma), Caroline Chung (the lead author of Central Nervous System), Meredith Giuliani (Survivorship), Andrew Hope (Cancer Informatics), Terry Michaelson (Cancer Informatics), and Danielle Rodin (Survivorship).

The principal focus of the 9th Edition is to guide management in an accessible and feasible manner to meet the needs of clinicians caring for cancer patients in all jurisdictions. As with prior editions, the Ninth Edition continues to emphasize a multidisciplinary perspective when addressing cancer management.

PHOTO: MCO (9th Edition) Editorial Board Members: Brian O'Sullivan (Editor-in-Chief), Sophie Huang (Editorial Coordinator) and James Brierley (Associate Editor)

RMP recognizes the importance of research capacity building in enabling innovation and positive change in cancer management. However, radiation oncology colleagues in low and middle income countries have unique challenges which hinder innovation. Motivated by the importance of increasing global access to radiation therapy, Rebecca Wong led the inaugural **Princess Margaret Cancer Centre-Ghana Research Mentorship Program**, designed as a joint mentorship strategy, in which faculty at the Princess Margaret provided methodological expertise and support to Ghanaian trainees.

The one-year mentorship program accepted its first cohort of five radiation oncology trainees in January 2015. The curriculum included 12 interactive weekly sessions on topics which included: statistics, data collection, systematic reviews, and ethics. The program successfully delivered its course content using readily available resources including “got-

meeting” and e-mail communications. Metrics collected demonstrated that critical appraisal skills were increased in the participating residents, and qualitative data from focus groups identified areas for future improvement. Lecturers from the Department of Radiation Oncology, Biostatistics and Bioethics from the UHN, as well as other radiotherapy centres in Toronto provided seminars throughout the program. Some students were assigned a mentor in Toronto (a staff radiation oncologist) and one in Ghana, for the duration of a year. Ghanaian participants have successfully submitted abstracts to international global health conferences in 2015, and there are now immediate plans to expand this program to trainees in Nigeria.

PHOTO: Horia Vulpe, radiation oncology resident in RMP (3rd from right) with staff oncologists Dr. Joel Yarney (left), Dr. Verna Vanderpuye (front) and the residents and fellows of the National Center for Radiotherapy and Nuclear Medicine, Korle Bu Teaching Hospital, Accra, Ghana.

RESEARCH

The Radiation Medicine Program (RMP) at the Princess Margaret Cancer Centre is a world-leader in radiation research aimed at improving the treatment of patients with cancer. The program encompasses the full spectrum of radiation research from basic biologic studies through translation biology and physics to clinical trials, health services and education research. Its objectives are aligned with those of the University of Toronto's Department of Radiation Oncology, UHN and the Princess Margaret Cancer Center. Research goals aim to develop more precise, personalized solutions that will cure more patients with fewer side effects.

In 2015, RMP revised its strategic plan, developing the **Strategic Roadmap to 2020**, which will guide research towards achieving Precision Radiation Medicine, Personalized Care and Global Impact. Priority research initiatives over the next five years will include:

- **Target cancer more precisely** through innovation in MR-guided technologies and proton therapy
- **Adapt radiation therapy** informed by tumor morphological, microenvironmental and genetic features
- **Enhance patient and survivor health** by better understanding the needs of our patients during and after treatment, measuring outcomes in a more relevant manner, managing long-term treatment side effects more effectively, and mitigating toxicity through tissue regeneration
- **Learn from all of our patients** by assembling comprehensive clinical, biological, dosimetric and outcomes 'big data' repositories to support research and innovation

RESEARCH THEMES

The RMP research program spans the breadth of the four professional disciplines of radiation oncology, radiation physics, radiation therapy and radiation nursing, and is led by nationally and internationally recognized experts.

There is strong collaboration with other academic and industry-based research groups within UHN, as well as external groups locally, nationally and internationally.

NOTABLE PEER-REVIEWED FUNDING

Kathy Han received funding for the project entitled, "The potential for Metformin to Improve Tumor Oxygenation in Locally Advanced Cervical Cancer." **Funding Source:** Radiological Society of North America

Fei-Fei Liu received funding for the project entitled: "Epigenetic reprogramming of Radiation Fibrosis Using Adipose-Derived Stromal Cells." **Funding source:** Canadian Cancer Society Research Institute

Alex Sun and Jean Pierre Bissonnette received funding for the project entitled: A randomized phase II/III trial to assess the efficacy and safety of metabolically adaptive dose escalation in locally advanced non-small cell lung cancer. **Funding Source:** Canadian Pulmonary Radiotherapy Investigators Group

Meredith Giuliani received funding for the project entitled CEASE: A novel electronic patient directed knowledge translation tool to improve smoking cessation in cancer patients. **Funding Source:** Cancer Care Ontario and Ontario Institute for Cancer Research.

David Jaffray received funding for the project entitled: Integrative, systems-level imaging (ISLI). **Funding Source:** Canadian Foundation for Innovation

NOTABLE PUBLICATIONS

I: Personalizing RT in breast cancer patients

Fei-Fei Liu and colleagues published a landmark report which identified a low-risk Luminal A breast cancer cohort that may not benefit from breast radiotherapy (DOI: 10.1200/JCO.2014.57.7999). Results indicated that women over age 60, with node negative luminal A breast cancer (T1, grade 1 or 2) on Tamoxifen could potentially avoid breast RT since their 10-year risk of local recurrence was <7%; with no apparent benefit from RT. These results directly led to the cross-Canada LUMINA trial which is examining this hypothesis in a prospective manner.

II: Expanding global access to radiotherapy

A team of RMP staff contributed to a landmark study describing the economic benefits of investing in radiation therapy in developing countries (DOI: [http://dx.doi.org/10.1016/S1470-2045\(15\)00222-3](http://dx.doi.org/10.1016/S1470-2045(15)00222-3)). Published in *Lancet Oncology*, this study was the first to quantify the worldwide coverage of radiotherapy services by country. Moreover, the authors showed the shortfall in access to radiotherapy by country and globally for 2015–35 based on current and projected need. These results provide compelling evidence for investment in radiotherapy, which not only enables treatment of large numbers of cancer cases to save lives, but also brings positive economic benefits.

III: Genetic drivers of prostate cancer

Robert Bristow published a study describing a new gene subgroup driving the development of multi-focal prostate cancer (DOI: 10.1038/ng.3315). The findings in this ground-breaking *Nature Genetics* study will enable development of clinical tests capable of informing doctors and patients about personalized treatments for each prostate cancer patient.

\$41M

Peer-reviewed funding

\$1M

Industry funding

145

Peer-reviewed grants

228

Peer-reviewed publications

372

Active clinical studies

186

Prospective clinical research protocols

10.5%

New patients accrued to prospective clinical research studies

PEOPLE

LEADERSHIP APPOINTMENTS

2015 saw a number of staff assume leadership roles both within and external to the program.

Jim Brierley: *Endocrine Group Leader.* He will lead the clinical and academic programs at the Princess Margaret Cancer Center.

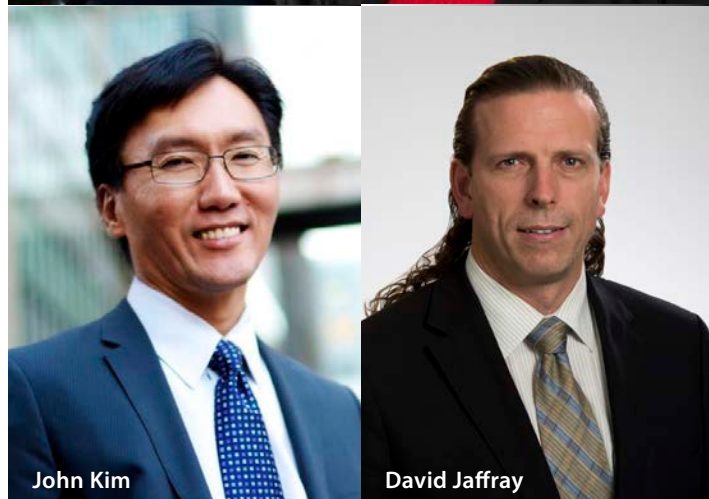
Jolie Ringash: *GI Site Group Leader,* succeeding John Kim. Jolie will foster research and interdisciplinary collaboration and educational initiatives in the RMP GI site group.

Colleen Dickie: *Radiation Therapy Practice Leader of Process Development and Integration.* She continues to lead the clinical implementation of the MRgRT facility.

Tracey Williams: Manager of DRO Administrative Services. She will continue to lead activities which increase administrative capacity.

John Kim: *Inaugural Ontario Head and Neck Cancer Lead at Cancer Care Ontario (CCO).* He will provide a disease specific lens to CCO's work.

David Jaffray: *Executive Vice President of Technology & Innovation at UHN.* He will work to ensure that UHN remains effective at delivering high-quality care, and plans to enable more cohesive collaboration across the organization.



NEW RECRUITS OF 2015

Radiation Oncologists: Drs. David Shultz, Jennifer Croke and Alejandro Berlin joined RMP as staff Radiation Oncologists.

Scientific Associate: Tara Spence joined the research team.

Radiation Nursing: Jennifer Deering, RN (EC)

Radiation Therapy: Karen Tse, Jessica Bonomo, Lindsay Bullen, Julie Kang, Mohsin Qureshi, Yilan Lu, Felicia Lo, Zabin Mawji, Amy Pham-Chau, Marie-Angela Cardella, Stephanie Chu, Stephen Genier, Amanda Hogan, Diana Lee, Erin Dowie, Elena Fong, Adrienne Lau, Pablo Lian, Louise Wei and Nathaniel So

Administration: Fakhar-Un-Nisa Chaudhry, Alexandra Pop, Ainsley Palmer, Melanie Robson

Welcome to all new hires!



RMP IN THE COMMUNITY

RMP Opens its Doors to Grade 12 Biology Class

On May 21st, 2015, 17 students from a grade 12 biology class at the People's Christian Academy visited the RMP for a fieldtrip organized by Jonathan So, Radiation Oncology Fellow. Students along with their teacher, Ms. Paas, participated in several hands-on activities which demonstrated the value of biology in advancing cancer treatment. Students learned about the influence of genetics and the endocrine system on cancer treatment and the importance of cancer screening and prevention.

With Meredith Giuliani's assistance, students followed a lung cancer patient's journey from diagnosis, to treatment, to survivorship. Their hands-on session included contouring palliative spine and lung cases, and running IMRT optimization. A tour of a radiation treatment unit led by Angela Cashell allowed students to try different immobilization devices, and provided an opportunity for them to learn more about the experiences of our patients undergoing treatment. The inter-professional nature of oncology and possible career paths in radiation medicine were discussed.

Pictured above: Students from Ms. Paas' grade 12 biology class at People's Christian Academy spend an afternoon learning about the biology of cancer and radiation therapy.

AWARDS & DISTINCTIONS

- **Mary Gospodarowicz** was awarded an **Officer of the Officer of Canada** July 1st, 2015
- **Michael Sharpe** was elected as a Fellow of the American Association of Physicists in Medicine (AAPM).
- **Mike Milosevic** was selected as the 2015 Gordon Richards Lecturer at the CARO 2015 Annual Scientific Meeting.
- **Pamela Catton** and **Audrey Friedman** were named winners of the 20 Faces of Change Awards.
- Radiation Therapist **Kevin LeNeve** was one of two winners of the Michael Kamin Hart Award.
- **Meredith Giuliani** won ESTRO Top Clinical Abstract Poster Award for her SBRT study entitled, *"Predictors and Patterns of Regional Recurrence Following Lung SBRT"*.
- **Negin Shahid** was recipient of the 2015 American Brachytherapy Society HDR Brachytherapy Scholarship
- **Srinivas Raman** was selected to attend the 17th Annual ECCO-AACR-EORTC-ESMO Workshop on Methods in Clinical Cancer Research in Flims, Switzerland.
- Physician Assistant **Maitry Patel** was awarded 2nd place at the Canadian Association of Physician Assistants' 2015 National Conference for her presentation focusing on *"An oncology patient's journey...A Physician Assistant's perspective."*
- **Derek Tsang** received the American Cancer Society (ACS) Audrey Meyers Mars International Fellowship in Clinical Oncology.
- **Danielle Rodin** (PGY4) received the Jean Roy Memorial Award at CARO (Canadian Association of Radiation Oncology).
- **Julia Skliarenko** won the 2015 Best Fellow Oral Presentation at CARO for her project *"Improving the Efficiency of MRI-Guided Brachytherapy for Cervical Cancer: Is Daily Plan Adaptation Required?"*
- This year's graduating Radiation Therapy Students presented student recognition awards to the following clinical radiation therapy staff who were instrumental in their learning experience: **Andrea Chow, Adrian Fung, Susan Galuszka, and Janet Hsu.**
- **Marco Carlone** was awarded the Innovation in Cancer Education award for his work on medical linear accelerators and complex therapeutic units, which require the highest quality of performance.

ADAPTIVE RADIOTHERAPY IDEAS GRANT RECIPIENTS:

- **Laura Dawson:** grant entitled: *"Toxicity Prediction Using Delivered Dose Reconstruction to Enable Evidence-Based Adaptive SBRT"*
- **David Hodgson:** grant entitled: *"A Machine Learning Approach to Personalized Radiotherapy for Lymphoma Patients"*
- **Beibei Zhang & Meredith Giuliani:** grant entitled: *"Adaptive Radiotherapy in Head and Neck Cancer: Personalizing Therapy in the HPV Era for Enhanced Response and Reduced Toxicity"*

UTDRO 2015 AWARD WINNERS

- Post Graduate Research Supervision: **Michael Milosevic**
- Best Clinical Teaching in the Undergraduate Medical Education Program: **Barbara-Ann Millar**
- Professional Development and Continuing Medical Education: **Stephen Breen** and **Marco Carlone**
- The Cummings Leadership Award: **Mary Gospodarowicz**
- Outstanding Research Potential: **Colleen Dickie**
- Sustained Excellence in Research: **Jolie Ringash**
- PGME Medical Trainee Leadership Award: **Danielle Rodin**
- The Inaugural Bernard J. Cummings Award for Research Excellence: **Danielle Rodin**



IN MEMORIAM

Dr. Michael Sharpe (February 3, 1965 – June 22, 2016)

Dr. Michael Sharpe was the Associate Head of Medical Physics in the RMP at the Princess Margaret Cancer Centre, an Affiliated Faculty of the Techna Institute, and an Associate Professor in the Departments of Radia-

tion Oncology and Mechanical and Industrial Engineering at the University of Toronto.

Dr. Sharpe received his Ph.D. in Medical Biophysics from the University of Western Ontario in 1997 and began his professional career as a Staff Physicist in Radiation Oncology at William Beaumont Hospital (Royal Oak, Michigan). He was certified by the American Board of Medical Physicists in 2000 and joined the Medical Physics team of the RMP in 2002 where he has worked tirelessly to advance the technology and practice of radiation therapy. He led the development of intensity modulated radiotherapy techniques for breast cancer and was a central part of the team that invented the active breathing control system for precision radiotherapy. Dr. Sharpe was also respected as a leading intellect in the development of image-guided radiation therapy techniques and was invited to lecture around the world on his work in the emerging field of adaptive radiotherapy. Over the brief course of his career, he authored over 60 peer-reviewed publications, as well as numerous book chapters in the field of radiotherapy. Today, Dr. Sharpe's innovations directly benefit patients of the Princess Margaret and across the world.

Despite his efforts to stay out of the limelight, Dr. Sharpe was widely recognized for his contributions. He was recipient of the Cancer Care Ontario's Innovation Award in 2007 and the University Health Network's Inventor of the Year Award in 2009. In 2015, Dr. Sharpe became a Fellow of the American Association of Physicists in Medicine in recognition of his significant contribution to the field of Medical Physics.

Dr. Sharpe had a passion and natural skill for mentorship, and an engaging approach to teaching which was valued by many. He served as the Quality Leader of Cancer Care Ontario's Radiation Treatment Program, delivering lectures on advanced radiotherapy techniques to medical physicists, radiation oncologists, and radiation therapists in local courses and at invited lectures around the world. He was also recruited by the American Society of Radiation Oncology (ASTRO) for their international teaching programs and in 2011, was a founding faculty member of the annual European Society of Radiotherapy and Oncology (ESTRO) course on Advanced Treatment Planning.

In addition to his passion for his family and his profession, Dr. Sharpe was passionate about cycling. After having discovered cycling just over 10 years ago, he took on a central role in the establishment of the RMP Accelerators team which participated in the annual Ride to Conquer Cancer of the Princess Margaret Cancer Foundation, Canada's largest cycling fundraiser. As team co-captain, Dr. Sharpe recruited many friends and colleagues to the sport. Although he knew that his fate was sealed, he signed up for next year's 10th anniversary of the ride, demonstrating his passion, commitment, and leadership to the end.

Dr. Sharpe's amicable nature, piercing intellect, and engaging persona created a remarkable network of friends, colleagues, and mentees that transcends time and space. He will be dearly missed by his friends and coworkers at UHN and by his many, many colleagues from around the world who have not ceased to send condolences upon hearing of his passing. Our thoughts and condolences are with his wife Jane, his two children - Gregor and Emily, his parents, siblings, nieces, and nephews. Although his loss is felt the world over, his significant contributions to the lives of his family and friends, as well as his ground-breaking work in the field of Medical Physics will ensure that his legacy continues.

LOOKING AHEAD

RMP continues on a path of sustained excellence, an achievement that is made possible by the resilient support, unwavering dedication and deep commitment of our talented, multi-professional team of staff. In 2015, we made strides in advancing cancer care on a global scale through research, pushed the boundaries in innovation, and contributed to enhancing practice through our award-winning research and education programs. The year culminated with the launch of a new strategic plan; **Roadmap to 2020**, which symbolizes our renewed commitment to excellence in patient-centered care, and our approach towards realizing our vision.

In the year ahead, we will work collectively towards implementing our Year-1 priorities, and we are excited to continually shape our program into one that delivers “Precision medicine. Personalized care. Global impact.” Achieving this vision will ensure that our cancer patients experience the best possible outcomes.

Together, we will continue to strive towards our mission “**to advance exemplary radiation medicine through patient care, research and education in partnership with our patients and community**”. By remaining true to our core values of innovation, excellence, collaboration, accountability and integrity, we will maintain our tradition of excellence, and transform the state of radiation medicine locally, nationally and internationally.

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To view the online version of the 2015-2016 Annual Report

<http://www.radiationatpm.com>

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