

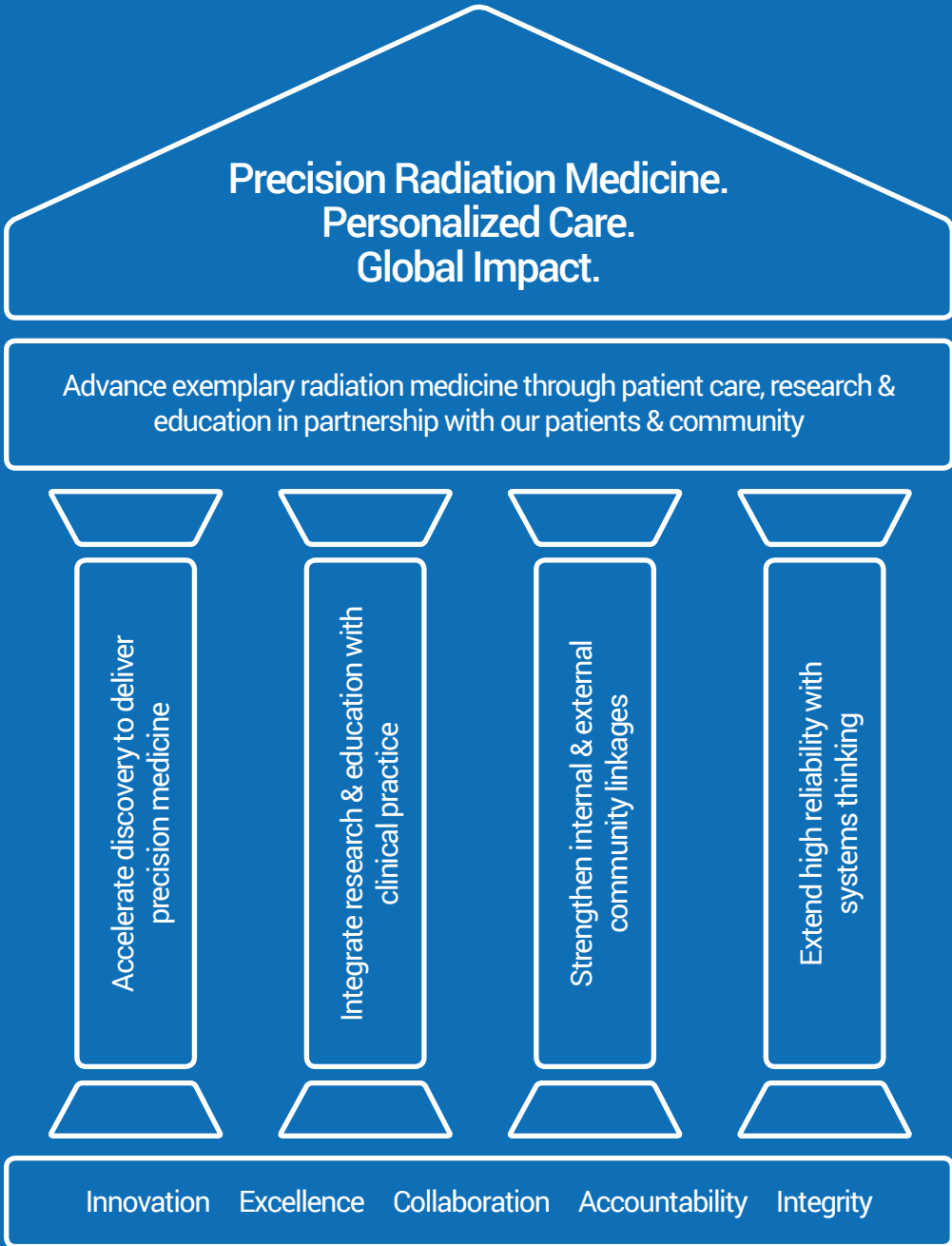


annual report
2017-2018
radiation medicine program



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a message from
the chief

The Radiation Medicine Program (RMP) at the Princess Margaret Cancer Centre, University Health Network (UHN) is committed to delivering the highest standard of care to its patients. Over the past year, we continued to push the boundaries of innovation, as we worked towards achieving our vision of **"Precision Radiation Medicine. Personalized Care. Global Impact."**

2017-2018 was another banner year for RMP, full of growth and progress. We made significant advancements and impact in each of the four pillars of our Strategic Plan, the **Roadmap to 2020**. Highlights included the clinical deployment of EVOQ, an in-house web-based software that provides automatic quality review of radiation therapy plans, in the Breast Site Group, as well as the establishment of the Radiomics for Radiotherapy Research Consortium to facilitate radiomics research within and beyond RMP.

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 reinforced existing partnerships and established new ones that will have a lasting and positive impact for our program and patients. We demonstrated our commitment to our patients by developing innovative care delivery approaches through research and system improvements, and continued to train future leaders in radiation medicine through the delivery of award-winning educational programs.

In December 2017, RMP successfully underwent its 5-Year External Review, resulting in my re-appointment as Chief of the Department of Radiation Oncology (DRO) and RMP at the Princess Margaret for another five-year term, effective April 2018. The international team of reviewers recognized the many accomplishments of RMP, describing it as one of the top academic cancer programs internationally, "reaching the prowess and reputation of the top North American Departments of Radiation Oncology, including MD Anderson Cancer Center and Memorial Sloan Kettering Cancer Center". Thank you to those who had participated in the review and to everyone in RMP for your continued hard work and unwavering dedication to our patients, and to our vision. Our achievements and successes are only made possible by the support and collaboration of our talented, multi-professional team. I look forward to what we can achieve together in the year ahead.

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 is the largest radiation treatment centre in Canada, and one of international acclaim. The program 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, this multi-professional group of over 380 staff work collectively to deliver high quality and safe radiation treatment to over 8000 cancer patients every year.

RMP has a diverse pool of talent, with many staff holding important leadership roles in patient-centred care, research and education at the local, national and international levels. Our research program, which spans from biological studies, translational biology and physics, clinical trials, to health services and education research, aims to innovate and advance radiation medicine practice, producing over 240 peer-reviewed publications annually.

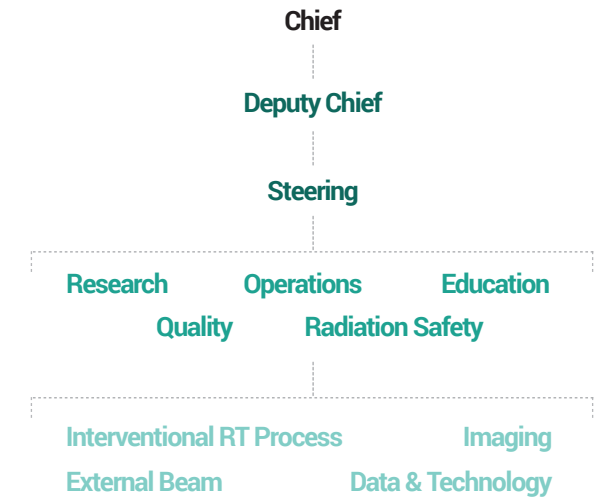
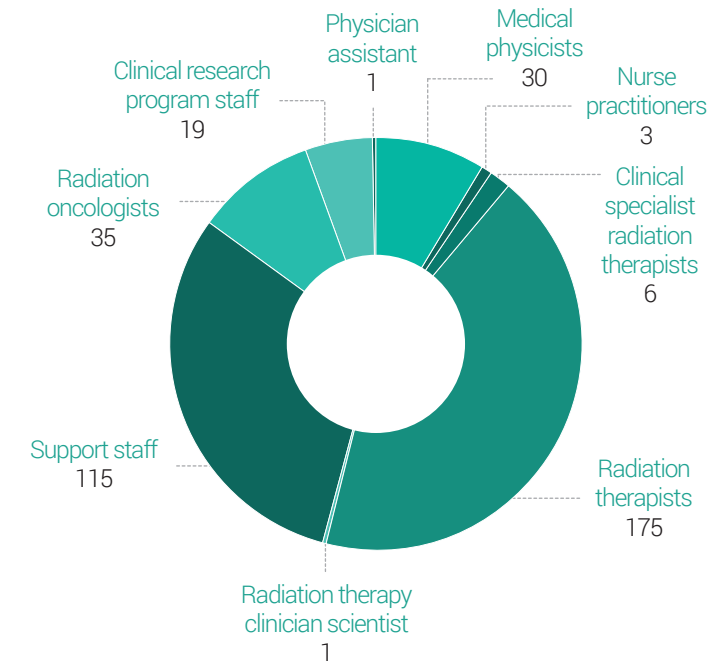
Our interdisciplinary environment facilitates the delivery of innovative education programs covering the complete spectrum of professional learning in radiation medicine. RMP offers training at the undergraduate, graduate and postgraduate levels in collaboration with the University of Toronto and Michener Institute of Education at UHN, as well as continuing medical education through our Observership and Accelerated Education Program (AEP).

state of the art facility

- 4 CT simulators (1 with PET)
- 1 MR simulator
- 16 Linear accelerators
- 2 Perfexion (Gamma Knife) units
- 1 Orthovoltage/superficial x-ray unit
- 2 Brachytherapy high dose rate (HDR) remote afterloaders
- 1 Magnetic resonance-guided radiation therapy (MRgRT) facility

interprofessional team

Our multi-talented, interprofessional staff enables all aspects of our program to succeed. Led by the Program Chief, 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.



2017 the year in numbers

10,738
radiation treatment courses*

8,611
patient consultations*

6,685
patients treated at Radiation Nursing Clinic*

\$46.7 million
peer-reviewed funding

242
peer-reviewed publications

354
active clinical studies

11.9%
new patients accrued to prospective clinical studies

26
radiation oncology residents

21
radiation oncology fellows

6
medical physics residents

37
medical radiation sciences students

**fiscal year statistics*

a year in review

strategic roadmap to 2020

Since the launch of the **Strategic Roadmap to 2020** in 2015, RMP has focused on implementing several key initiatives and activities to help achieve its four strategic priorities to: 1) accelerate discovery to deliver precision medicine for best patient and population outcomes; 2) integrate research and education with clinical practice; 3) strengthen internal and external community linkages; and 4) extend high reliability with systems thinking. Key highlights from 2017-2018 are shown.

Extend high reliability with systems thinking

- Clinical deployment of EVOQ in Breast Site Group and completion of training for site group staff
- Developed a “Lead with Strong Project Management Skills” module for experienced project leads within RMP
- 60% of project leads (~46 RMP staff) for Therapy, Physics and DRO completed formal project management training through the UHN Practical Project Management Course

Strengthen internal & external community linkages

- Developed a RMP-tailored 8-week REFRESH Series Program to promote wellness practices amongst staff
- Hosted a continuing education dinner with referring physicians from St. Joseph’s Health Centre, St. Michael’s Hospital and Humber River Hospital
- Established end-to-end alignment of all clinical administrative activities – from intake at referral to post-treatment follow-up – under the DRO Manager
- Offered a Workplace Violence Lunch and Learn Session for RMP staff

Accelerate discovery to deliver precision medicine

- Established the Radiomics for Radiotherapy Research (R3) Consortium to facilitate radiomics research in RMP
- Implemented RayStation in the clinic as the fundamental platform for radiation dose accumulation and adaptive replanning for future adaptive radiation treatment protocols
- Piloted the Case-Expert Radiation Therapist model in upper GI, breast, lung and head & neck site groups to assess feasibility and improvements in patient care
- Formalized patient partners in 2 RMP committees (Radiation Therapy Patient Education Committee & Quality Committee)
- Conducted a MRgBT Program review to identify personnel, space and equipment requirements for the next 5-10 years
- Secured partial funding for expanded clinical care and research MRgRT space

Integrate research & education with clinical practice

- Implemented a standardized “opt-out” research consent process for patients receiving treatment in the MRgRT suite
- Delivered a successful Mystery Dinner on Quality and Safety in partnership with CPQR as a pre-CARO workshop
- CPQR contracted AEP to facilitate the development and implementation of their first online Radiation Therapy Incident Learning Course
- Successfully launched a new Soft Tissue Sarcoma AEP Course
- Expanded the Africa-Princess Margaret Clinical Research Mentorship Program to include Zimbabwe (2 residents)
- Signed MOU with TAAAC to support the development of a BSc Radiation Therapy Training Program in Ethiopia



clinical care

Our clinical practice encompasses all aspects of cancer care – from diagnosis to survivorship. In 2017-2018, RMP provided 8611 patient consultations and delivered 10,738 courses of radiation treatment, with 82% of new patient consultations being conducted within the 14-day target established by Cancer Care Ontario (CCO). There were 6685 visits to the Radiation Nursing Clinic (RNC) for symptom and side-effect management.

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 interprofessional team works collaboratively to assess, plan and deliver personalized care to our patients.

Clinical Teams

Superteams Tumour Site Groups

Team 1	Endocrine, eye, head & neck, skin
Team 2	Breast, lung, upper gastrointestinal (GI)
Team 3	Genitourinary (GU), gynecological (GYN), lower GI
Team 4	Central nervous system (CNS), leukemia, lymphoma, palliative, pediatrics, sarcoma

Specialized Programs

Brachytherapy	Palliative Radiation Oncology
Gamma Knife Radiosurgery	Pediatric Radiation Therapy
Oligometastases	Stereotactic Radiation Therapy



world class program

RMP successfully completed its 5-Year External Review in December 2017, with **Fei-Fei Liu** being re-appointed for a second five-year term as Chief of RMP. The international team of reviewers described RMP as one of the top academic cancer programs internationally, “reaching the prowess and reputation of the top North American Departments of Radiation Oncology, including MD Anderson Cancer Center and Memorial Sloan Kettering Cancer Center”. In particular, RMP’s enviable Quality and Patient Safety Program, the Radiation Nursing Clinic, QuickStart Program, Survivorship Program, Gynecologic Brachytherapy Program and successful integration of CSRTs were noted as prime examples of the many outstanding highlights within its clinical program. RMP’s breadth and depth of academic impact was described as exemplary with its education and research programs achieving some of the highest standards internationally.

“**Few, if any, Radiation Oncology Departments can pride themselves in such a large number of significant achievements. Many of us in Radiation Oncology look to RMP for leadership, guidance and direction in a myriad of topics from translational medicine, to quality improvement, to physics innovations.**

External reviewers

excellence in patient care

Alejandro Berlin was the recipient of the 17th Annual Gerald Kirsh Humanitarian Award, which recognizes exemplary and compassionate patient care provided by staff and volunteers at the Princess Margaret. Dr. Berlin’s compassion and excellence in clinical care serves as a role model for all of us at RMP.



Paul Alofs, Srikala Sridhar, Michael Reedijk, Shahnaz Bassiri, Alejandro Berlin, Kimberley Miller, Melissa Jageshar, Santhosh Thyagu

“**[Dr. Berlin’s] ability... to see the situation with fresh eyes enabled us to proceed with the correct treatment. He will leave no stone unturned and spare no effort to make that happen.**

Patient

celebrating end of treatment

RMP launched its “End of Treatment Gong” on level 2B at the Princess Margaret in April 2018 to create an opportunity for patients and family members to celebrate this important milestone. A gong was chosen as its sound symbolizes the restoration of balance, harmony and life energy. The quote on the adjacent signage “Let your courage and determination resonate with us all” was selected through a staff competition. The preliminary feedback from patient and family members has been positive, with many enjoying celebrating this important end of treatment milestone.



building capacity for radiation therapists

RMP has participated in the MOHLTC’s Clinical Specialist Radiation Therapist (CSRT) project since its inception in 2007. This innovative project, initiated by **Mary Gospodarowicz, Pamela Catton** and **Nicole Harnett** aimed to improve patient care through the province-wide creation of advanced practice roles in radiation therapy. These positions combine expert clinical, technical and academic skills to provide leadership in the advancement of radiation therapy practice. RMP currently has six CSRTs integrated within various site groups. After 10 years of work and research, the Canadian Association of Medical Radiation Technologists (CAMRT) announced the official launch of the Advanced Practice in Radiation Therapy Certification Process in July 2017, providing a standardized means to recognize and certify radiation therapists working to the defined advanced level in Canada. This formal certification is the first of its kind in the world and is expected to be the gold standard for advanced practice for radiation therapists going forward.

first patient treated with Gamma Knife Icon

In November 2017, RMP treated its first mask-based patients on the new Gamma Knife Icon, which was invented by **David Jaffray** and his team at the Princess Margaret. The successful system upgrade was driven by the dedication and collaboration of a multidisciplinary team comprised of radiation oncologists, physicists and therapists, from machine installation and commissioning, to protocol and procedure implementation. This marks the start of new opportunities for the Princess Margaret's Brain Metastases and CNS programs. RMP now has the ability to deliver frameless stereotactic fractionated radiotherapy, thereby allowing patients to be treated more comfortably, and larger tumours to be targeted more effectively. The ICON will also potentially allow RMP to expand the use of the Gamma Knife to a cohort of patients with primary CNS tumours, with dose distributions that are tighter than previously possible.

Leadership Appointments

Angela Alivio was promoted to the role of Business Administration Manager in the Department of Medical Physics, effective November 2017

Charles Catton was appointed as the DRO Sarcoma Site Group Leader, effective April 2017, succeeding **Brian O'Sullivan**, who held this position since 1991

Peter Chung was appointed as the DRO GU Site Group Leader, effective November 2017, succeeding **Charles Catton**, who held this position for well over 15 years

Colleen Dickie was appointed as the Director of Operations of RMP, effective April 2018, succeeding **Sophie Foxcroft**, who held this position since 2013

Joanna Javor was appointed as the Palliative Clinical Specialist Radiation Therapist, effective July 2017

John Kim assumed the role of Deputy Chief of RMP, effective April 2018

Normand Laperriere was appointed as the interim Princess Margaret CNS Site Group Leader, effective February 2018

Winnie Li assumed the role of interim Process Development and Integration Practice Leader – Radiation Treatment Delivery with RMP, effective March 2018

Fei-Fei Liu was re-appointed as Chief of DRO and RMP at the Princess Margaret Cancer Centre/UHN for another 5-year term, beginning April 2018

Barbara-Ann Millar was appointed as the DRO CNS Site Group Leader, effective April 2017



transforming treatment planning with AI

A team led by **Thomas Purdie** and **Chris McIntosh** has developed AutoPlanning, a novel artificial intelligence (AI) technology for automated radiation therapy treatment planning. RT treatment plans generated manually can take hours or days. With AutoPlanning, plans can be ready for review within minutes, generating highly-personalized plans best suited for each patient. This new technology allows the radiation team to plan more complex cases and provide precision medicine to more patients. Based on its success, the AutoPlanning AI technology has been licensed to RaySearch Laboratories for incorporation into RaySearch's RayStation treatment planning system, and will now be available to hospitals across the globe, allowing them to create better plans more efficiently.

quality & safety

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

1. **Performance Indicators**, aimed at evaluating compliance with relevant standards
2. **Quality Assurance**, aimed at monitoring radiation treatment quality control processes
3. **Quality Education**, aimed at contributing to quality and safety competence through education
4. **Incident Learning**, aimed at managing an incident learning system



**All committees operate in accordance with the Quality of Care Information Protection Act*

82% of cases within referral-to-consult wait time target

92% of cases within ready to treat-to-treatment wait time target

89% of radical cases peer reviewed

excellence in performance

The RMP QC uses the standards set by Cancer Care Ontario, Canadian Partnership for Quality Radiotherapy (CPQR) and Accreditation Canada to provide guidance in developing and maintaining quality in the program.

CCO Performance Measures

CCO monitors 3 key performance areas: referral-to-consult wait times, ready to treat-to-treatment start wait times, and peer review rates. The CCO targets for consult and treatment start wait times within 14 days were met at the 80% and 85% rates, respectively. The peer review target was 75% of all radical cases to be reviewed; RMP (89%) exceeded both the CCO expectations and average provincial performance targets in 2017.

CPQR Program Compliance

CPQR has published a series of 16 guidelines in 3 categories: technical quality control, quality assurance and patient engagement. Compliance has been assessed against 94% of the guidelines; 3 were deemed not applicable to RMP practice, full compliance was determined in 9, and partial in 3. Assessment against the remaining guideline is targeted for the coming year.

Accreditation Canada Standards

Accreditation Canada introduced 32 new radiation therapy specific standards to the Qmentum Program in 2017. In anticipation of accreditation in November 2018, the RMP QC has completed a review of the radiation standards in order to assess and address areas of non-compliance. Full compliance was determined in all 32 standards as of June 2018.

**calendar year statistics*



incident learning course for radiation medicine professionals

The success of the CPQR/CIHI NSIR-Radiation Treatment System depends on its utility within local radiation treatment programs. In order to facilitate awareness and utilization of NSIR-RT, the CPQR developed an online incident learning course for practicing radiation medicine professionals to promote a consistent pan-Canadian approach to incident investigation, analysis and reporting.

Offered for the first time in November 2017 in partnership with CIHI and AEP, the 7-week course (“Radiation Treatment Incident Investigation and Analysis”) included weekly web-based lectures and a series of case-based assignments designed to teach Canadian radiation professionals to effectively investigate local incidents using the Canadian Patient Safety Institute (CPSI) guidelines, identify trends through local and pan-Canadian incident analysis, and inform programmatic changes in order to improve overall patient care and outcomes. Led by **Michael Milosevic** with **Jean-Pierre Bissonnette**, **Lyndon Morley** and **Stephen Breen** as course faculty, this well-received course had 20 learners of radiation oncologists, physicists and therapists from across Canada. Participants indicated that the course helped increase their understanding of incident classification systems through interactive sessions and assignments.

Quality Education

The RMP QC aims to offer educational activities that enhance staff competence in quality and safety. In 2017-2018, a monthly “Radiation Therapy Quality Forum” was piloted and 8 RMP Quality Conference sessions were delivered. Through a concerted effort from RMP leadership, including **Lyndon Morley**, **Brandee Pidgeon** and **John Kim**, RMP not only had 92% of staff attending UHN’s Caring Safely training session in 2017, but also the highest number of physicians (100%) registered amongst any program at UHN. This is a true testament to the exemplary engagement and leadership within our program.

Quality Assurance

Treatment Plan QC

Treatment plan status is captured in Web-Publishing. Plans that are approved have been planned, published, reviewed, accepted and proceeded to treatment. Rejected and discontinued plans represent rework and potential errors in treatment plan production. In 2017-2018, the rate of rejected plans in RMP was 3%, achieving its annual goal of <5%.

Infrastructure QC

Monthly machine quality control (QC) tests are an essential component of ensuring the accuracy of machine functionality and parameters. AQUA is a data repository that describes tests, identifies the responsible individual(s), and allows for tracking of their completion and pass/failure rates. Machine physics leads review AQUA data and a monthly Physicist Quality Forum is used to review and discuss this infrastructure QC data. In 2017-2018, the average compliance for QC test completion was 99.5%, and consistently high month to month.

Incident Learning

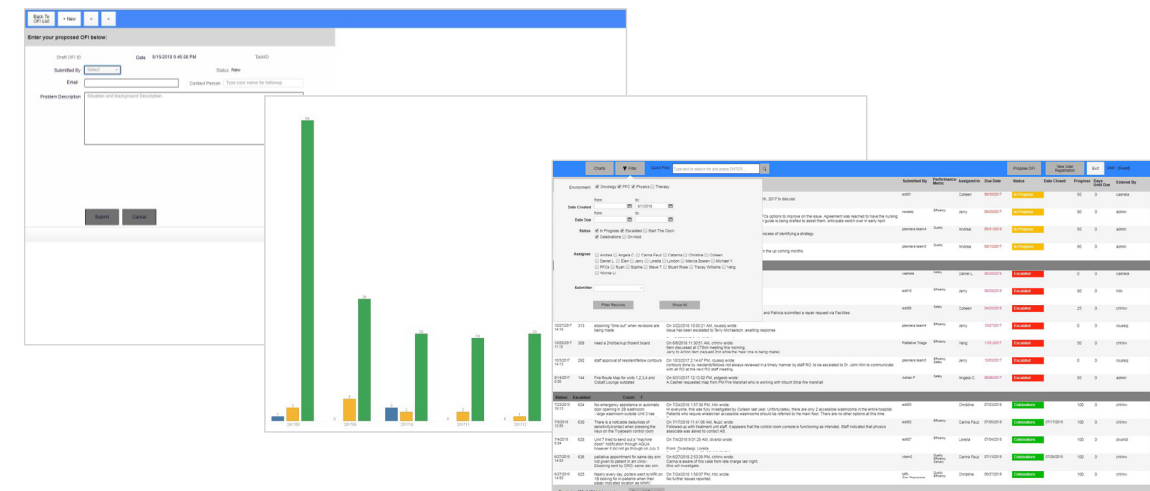
The RMP QC reviews the number of incident reports by type and severity at a monthly interval. Out-of-control events are investigated for root cause analysis. There were 286 reported events in 2017-2018 (up from 210 last year). No Serious Safety Events and Never Events were reported in 2017. The increase in incident reporting rates may be attributable to the introduction of daily safety huddles, greater levels of outreach by leadership, including timely and direct encouragement to report events. The development of the Opportunities for Improvement (OFI) electronic submission and tracking system used by radiation therapists may have also contributed to increased reporting.

RMP’s incident reporting summary forms have been updated to adopt the new UHN severity classification criteria, as well as to be consistent with the CPQR/CIHI (Canadian Institute for Health Information) National System for Incident Reporting in Radiation Therapy (NSIR-RT). RMP now regularly submits incident reports to this national database.

new safety huddle database: closing the loop

In line with the launch of UHN’s safety huddle initiative in 2017, frontline RMP staff have adopted the safety huddle methodology for reporting and creating additional situational awareness for all issues relating to quality, safety, efficiency and treatment delivery. In order to streamline the process of collating and tracking the Opportunities for Improvement filed by staff, a new safety huddle electronic database was developed in-house and launched in November 2017.

The user-friendly database is accessible to all staff within the program *via* the RMP intranet website. It has enabled real-time submissions of quality and safety reports, and enhanced accountability and transparency of OFI submissions for all stakeholders. It also allows the tracking of reported issues that have been successfully resolved. This initiative has fueled reporting of safety events within the program. It offers staff a platform to voice concerns, promoting a culture where staff feel that their opinions are valued, and can make an impact within their workplace.



research

RMP is a world leader in radiation medicine research aimed at developing more precise, personalized treatments to cure more patients with fewer side effects. RMP clinicians and scientists are internationally recognized for their expertise in clinical oncology, translational tumour biology, medical physics and engineering, among others. The program encompasses the full spectrum of radiation medicine research from laboratory-based biology and physics discovery to clinical trials in patients, including survivorship, health services and education research.

RMP is disrupting the radiation treatment landscape through new adaptive radiation oncology research and knowledge dissemination to assure the right treatment at the right time for every patient. This is being accomplished through innovative approaches that integrate clinical care and research, as well as by learning from all of our patients, while focusing on the outcomes that matter most to patients during their cancer journey.

RMP research activities are strategically focused on six key domains to accelerate the availability of adaptive radiation oncology for every patient:

1. **Radiogenomics**
2. **Radiomics**
3. **MR-guided radiotherapy**
4. **Oligoprogression**
5. **Regenerative radiation medicine**
6. **Patient-reported outcomes anthology**

These research themes are highly integrated and closely aligned with the research objectives of the Princess Margaret, UHN and University of Toronto's Department of Radiation Oncology. There are strong collaborations with other academic and industry-based research groups within UHN, as well as external groups locally, nationally and internationally.

excellence in cancer research



Mary Gospodarowicz, Sophie Huang, Carol O'Sullivan, Jonathan Irish, Brian O'Sullivan, Colleen Dickie, Fei-Fei Liu, John Waldron

Brian O'Sullivan was awarded the 2017 Canadian Cancer Society O. Harold Warwick Prize for outstanding achievements in cancer control research. With a focus on head and neck cancer, his research program has advanced the delivery of radiotherapy using image-guided and molecular targeting – findings that he has also helped to translate into potential therapeutic approaches to help patients.



\$46.7M
peer-reviewed funding



\$0.7M
industry funding



116
peer-reviewed grants



242
peer-reviewed publications



354
active clinical studies



184
prospective clinical research studies



11.9%
new patients accrued to prospective clinical research studies

**calendar year statistics*

Notable Publications



Earlier Colonoscopy Screening for Young Cancer Survivors

David Hodgson and colleagues published the first evidence that early-onset colorectal cancer in young cancer survivors previously treated with abdominal/pelvic radiation therapy could be detected with colonoscopy screeningⁱ. The prevalence of abnormal growths (polyps) in their bowel was comparable to what would be found in people aged 50 or older, for whom colonoscopies would be routinely recommended. Published in *Gut*, these landmark findings support the early initiation of screening amongst young cancer survivors.



Genomic Hallmarks of Prostate Cancer

Robert Bristow and colleagues reported the world's most comprehensive genetic analysis of prostate cancer tumours in *Nature*, identifying a new gene signature that is able to predict the development of aggressive prostate cancer at an early time; allowing for personalized treatments in the future^v. The study is part of the Canadian Prostate Cancer Genome Network (CPC-GENE).



New Standard of Care for Prostate Cancer

Charles Catton and colleagues were the first to report that compressing radiation treatments into four weeks from eight delivers similar outcomes in terms of cancer control or treatment-related side effects for localized prostate cancer patientsⁱⁱ. The Ontario-led international clinical trial, published in the *Journal of Clinical Oncology*, provide a new standard of care worldwide, which participating centres have already adopted.



Predictors of Liver Toxicity Following SBRT

Michael Velec and colleagues identified risk factors associated with deteriorating liver function in hepatocellular carcinoma patients treated with stereotactic body radiation therapy (SBRT), including a higher baseline Child-Pugh score, several liver dose-volume metrics (e.g. mean dose, effective volume), and a lower baseline platelet count and portal vein thrombus^v.



Quality and Safety Competency Curriculum for Radiation Oncology Residency

Meredith Giuliani and colleagues developed the first entry-to-practice quality and safety competency profile for radiation oncology (RO) residency education through international consensus with 15 RO experts, representing 13 centres in 5 countriesⁱⁱⁱ. This profile may form the basis of quality and safety training standards in RO residency programs going forward.



Prognostic FDG-PET/CT Image Features for Lung Cancer

Jean-Pierre Bissonnette and colleagues were the first to identify FDG-PET/CT image features with optimal prognostic potential for locally-advanced non-small cell lung cancer patients^{vi}. Image features involving nodal disease were the only ones associated with overall survival.

Notable Peer-Reviewed Funding

Alejandro Berlin: [18F]DCFPyL PET/MR-Defined Oligometastatic State for Curative-Intent Stereotactic Ablative Radiotherapy (SABR) in Men with Recurrent Prostate after Maximal Local Therapies. Astellas Prostate Cancer Innovation Fund, Department of Surgery, University of Toronto

Alejandro Berlin: Subpathologies and Genomic Classifier for Individualized Post-Prostatectomy Radiotherapy. ESTRO–Varian Research Award

Alejandro Berlin and **David Jaffray:** Quantitative Molecular Imaging to Improve the Management of Prostate Cancer. Terry Fox Canadian Comprehensive Cancer Centre Network (TF4CN)

Scott Bratman: Minimal Residual Disease Detection in Head and Neck Cancer Patients through Ultra-Sensitive Sequence Analysis of Circulating Tumor DNA. Career Development Award, Conquer Cancer American Society of Clinical Oncology (ASCO) Foundation

Peter Chung: A Deformable Dose Accumulation in Prostate Cancer Trial (ADDAPT). Astellas Prostate Cancer Innovation Fund, Department of Surgery, University of Toronto

Caitlin Gillan and **Meredith Giuliani:** EPOCCC – Empathic Patient-Oriented Communication in Cancer Care. Medical Humanities Education Grant, University of Toronto

Meredith Giuliani: Development and Implementation of a Digital Toolkit to Teach and Reinforce Best Practices in Feedback and Action Plan Coaching to Support Competence by Design. Competency-Based Medical Education Residency Education Implementation Award, University of Toronto

Joelle Helou, Charles Catton and **Laura Dawson:** Stereotactic Ablative Radiotherapy for Renal Tumours. UTDR Collaborative Seed Grant

Fei-Fei Liu, Scott Bratman and **Benjamin Haibe-Kains:** Seeking Molecular Signatures for Nasopharyngeal Carcinoma. Canadian Institute for Health Research (CIHR) Project Grant

Benjamin Lok: Optimizing PARP Inhibitor Therapy in Combination with Radiotherapy for Small Cell Lung Cancer. Career Development Award, Conquer Cancer ASCO Foundation

David Shultz: Circulating Tumour DNA Detection in Soft Tissue Sarcomas. Sarcoma Cancer Foundation of Canada

Michael Velec: Deformable Image Registration-Enabled Cumulative Total (DIRECT) Dose Adaptation in Prostate Radiotherapy. AbbVie-CARO Uro-Oncologic Radiation Award (ACURA)

Michael Velec, Tony Tadic and **Vickie Kong:** Quality Assurance of Image Registration for Adaptive Radiotherapy. Chesney Research Award, International Society of Radiographers and Radiological Technologists

Alex Vitkin: Wide-Field Polarimetric Imaging for Targeted and Rapid High-Sensitivity Analysis of Breast Cancer Margins and Heterogeneity with Mass Spectrometry. CIHR



first radiation therapist to win Sanofi–CARO Award

Vickie Kong, Charles Catton, Peter Chung, Andrew Bayley and **Tim Craig** received a Sanofi–Canadian Association of Radiation Oncology (CARO) Award for their project entitled “Image Guidance Strategies for Pelvis and Prostate Radiotherapy – A Comparison Based on Accumulated Delivered Dose”. Vickie is the first radiation therapist to ever win this award. This research project showcases the strengths of RMP’s interprofessional groups and is an outstanding example of our radiation therapists leading important clinical research initiatives in Canada.

innovation in radiation therapist-led research

RMP radiation therapists authored two of the Top 5 *Journal of Medical Imaging and Radiation Sciences* articles in 2017 as selected by the Editor-in-Chief:

Kitty Chan, Angela Cashell, Tara Rosewall: “From Computed Tomography-Guided to Magnetic Resonance Imaging-Guided Intracavitary Brachytherapy for Cervical Cancer: What Do the Key Stakeholders Have to Say about the Transition?”^{vii}

Olive Wong, Caitlin Gillan, Nicole Harnett, Winnie Li: “Evaluating the Effectiveness of an Electronic Learning Tool for Volumetric Imaging Training – Perceptions of Radiation Therapy Professionals”^{viii}



Notable Awards and Distinctions

Scott Bratman: Appointed as a Clinician Scientist by the Ontario Association of Radiation Oncologists

Kitty Chan: Cureus Poster Award at the 2017 CARO Conference for her project entitled “Implementation of Real-Time MR-Guided Interstitial Brachytherapy for Gynecological Cancer”

Jennifer Croke: Best Abstract in Survivorship Award at the 2017 CARO Conference for her project entitled “Patient-Reported Sexual Health After Definitive Chemoradiotherapy and MR-Guided Brachytherapy for Cervix Cancer”

Meredith Giuliani: International Association for the Study of Lung Cancer Young Investigator Award

Mary Gospodarowicz: Wendy Lack Women of Action Scientific Award from the Israel Cancer Research Fund

Kathy Han and **Scott Bratman:** ASTRO Meeting Travel Award for their project entitled “Plasma HPV DNA as a Biomarker of Response in Patients with Locally Advanced Cervical Cancer Treated with Definitive Chemoradiation Therapy”

Vickie Kong: ESTRO Best Poster Award by a Radiation Therapist

Fei-Fei Liu: ASTRO Basic/Translational Science Abstract Award for her project entitled “Mitigating Radiation Fibrosis through Metabolic Regulation”

Michael Velec: Canadian Cancer Research Conference Early Career Researcher Travel Award

Alex Vitkin: Michael S. Patterson Publication Impact Prize in Medical Physics by the Canadian Organization of Medical Physicists for his paper entitled “Speckle Variance Detection of Microvasculature using Swept-Source Optical Coherence Tomography”

Olive Wong: One of the first recipients of the CARO-CROF Radiation Therapist Travel Grant Award

Olive Wong: Best Abstract by Radiation Therapy Award at the 2017 CARO Conference for her project entitled “Survival Impact of Cardiac Dose in Lung Stereotactic Body Radiotherapy”

education

As the largest single-site radiation medicine program in North America, RMP provides one of the most comprehensive clinical settings for the formal training of radiation oncologists, physicists and therapists. RMP's education portfolio is closely aligned with that of the University of Toronto's Department of Radiation Oncology as a fully-affiliated teaching hospital of the University. This strategic alignment enables the optimal utilization of educational expertise and infrastructure, and facilitates the achievement of the central education mandate of RMP and UTDR.

The formal professional training programs include: undergraduate training for radiation therapy (BSc Medical Radiation Sciences) and medical education; post-graduate training programs for radiation oncology residency, fellowship and physics residency; as well as the Master of Health Science in Medical Radiation Sciences (MHScMRS) graduate program and the Strategic Training in Transdisciplinary Radiation Science for the 21st Century (STARS21) training program. RMP staff also teach residents and fellows from other training programs, as well graduate students from University of Toronto Departments, such as the Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, Nursing, Institute of Medical Science, Institute of Biomaterials & Biomedical Engineering, and Medical Biophysics.

RMP offers interdisciplinary continuing education catered to practicing radiation medicine professionals, who seek to gain informal or structured learning experiences at the Princess Margaret, including the RMP Observership Program; the Accelerated Education Program, which delivers in-depth structured 2-3 day courses; and the Personalized Learning Program™ (PLP™) in Radiation Medicine, which offers 3-6 months of on-site and online learning opportunities.

“It's always valuable to see how people work at a different centre. Otherwise it's easy to become “siloe”. Thank you for opening your facility and sharing your expertise.

AEP course participant

Diverse Learners

Undergraduate

- 37 BSc Medical Radiation Sciences students
- 36 Undergraduate Medical Education students
- 2 CARO-CROF students
- 8 Summer students

Graduate

- 1 MHSc Medical Radiation Sciences student
- 18 Strategic Training in Transdisciplinary Radiation Science for the 21st Century scholars

Post-Graduate

- 26 Radiation oncology residents
- 21 Radiation oncology clinical fellows
- 6 Medical physics residents

Continuing Education

- 42 Observers from 10 countries
- 9 Residents in Africa-PM Clinical Research Mentorship Program
- 63 AEP participants (3 on-site AEP courses)

**academic year statistics*

Leadership Appointments

Jennifer Croke was appointed as the Director of the RMP Observership Program, effective August 2017, succeeding **Normand Laperriere**, who served as the Oncology Observership Program Lead for the past 27 years

Joelle Helou assumed the role of Director of Radiation Oncology Residency Research at UTDR beginning July 2017, succeeding **David Hodgson**, who held this position since 2013

Fei-Fei Liu was reappointed as Chair of the Department of Radiation Oncology at the University of Toronto for another 5-year term, beginning July 2017



first radiation oncologist appointed as University Professor

Mary Gospodarowicz is the first Radiation Oncologist to be appointed as University Professor at the University of Toronto. This very prestigious assignment is the highest academic rank bestowed at the University, recognizing exceptional scholarly achievement, and preeminence in a particular field of knowledge; comprising no more than 2% of all tenured faculty.

excellence in teaching

Barbara-Ann Millar was the 2016-2017 recipient of the Colin Woolf Award for Teaching Excellence in Continuing Professional Development (CPD) from the University of Toronto, in recognition for her sustained commitment to continuing medical education throughout her academic career. Through her many educational leadership roles, she has continually pushed the boundaries of teaching innovation and excellence to inspire trainees and professionals at the institutional and national levels.



Peter Chung, Barbara-Ann Millar and their children

50th course celebration

The Accelerated Education Program (www.aepeducation.ca) at the Princess Margaret has been putting innovation to work and delivering educational content to global colleagues since 2006. Over 1300 attendees from over 30 countries have participated in AEP's on-site IGRT, IMRT, Quality & Safety, and Accelerator Technology courses. In April 2018, AEP delivered its 50th course with its ever popular “Liver SBRT IGRT Education Course” led by **Laura Dawson**. To commemorate this important milestone, all RMP staff and faculty who have contributed to the success of AEP over the past 12 years were invited to a “To the Next 50 Courses” celebration event.



Laura Dawson opening the 50th AEP course



Nicole Harnett, Caitlin Gillan, Emily Milne, Rebecca Wong, David Wiljer at celebration event



Jasmine Chan, Shagun Misra, Ashwathy Mathew, Andrea Shessel, Anita Vloet, Grace Wu, Alana Pellezzari

building global capacity in radiation medicine

As global leaders in clinical practice, research and education, RMP actively disseminates its knowledge and best practices so that quality care can be available to all patients within our community and globally. In 2017-2018, RMP hosted 42 observers from 10 countries. Observers spent a median of 5 days (range: 1-26) at RMP, and included health professionals from radiation oncology (14%), medical physics (5%), radiation therapy (10%), as well as trainees (71%). RMP continued discussions with our global partners in Africa, Jamaica, United Kingdom, Hong Kong and China on strategies to leverage radiation and educational expertise to enhance global capacity within radiation medicine. Highlights from 2017-2018 are shown.

Harrison McCain Radiation Training Program

RMP received funding from the Harrison McCain Foundation to develop a training program to enhance capacity in state-of-the-art technology implementation for Atlantic Canada radiation medicine professionals and to create training tools that will further disseminate learning within radiation departments.



Joel Yamey, Horia Vulpe and Korle Bu Hospital staff

Clinical Research Mentorship Program

7 radiation oncology residents from the National Centre of Radiotherapy and Nuclear Medicine, Korle Bu Teaching Hospital in Ghana have participated in the 1-year remote mentorship program since its launch in 2015. The program is designed to teach critical appraisal and introductory research skills.

“**Definitely one of the best experience as an observer in radiation oncology in the biggest radiation oncology program. All the staff is warm, available and interested. Clinics are organized in the best [interest] of the patient.**

Observer

Observers by Country

Australia	2	Mexico	2
Brazil	1	Norway	2
Canada	25	Saudi Arabia	1
China	1	Spain	1
Ireland	2	United Kingdom	5



Laura Dawson and HKU-SZH staff

Brian O'Sullivan and Sophie Huang

Sanming Project of Medicine

RMP and the University of Hong Kong-Shenzhen Hospital (HKU-SZH) in Shenzhen launched the Sanming Project of Medicine in December 2017. The project aims to build local clinical and research capacity in radiation medicine by focusing on areas such as establishing a precision radiotherapy program, QA/QC system, tumour banking, as well as training programs for HKU-SZH radiation oncologists, physicists and therapists. To celebrate the launch of the new partnership, RMP and HKU-SZH co-hosted the First International Symposium on Specialist Education and Advances in Radiation Oncology in Shenzhen on December 2-3, 2017. This partnership is expected to provide a platform to exchange knowledge and experiences in patient care, research, education and training, with the aim of advancing HKU-SZH as a world-class cancer centre.

“**The faculty and colleagues have been so helpful here. They always make time for me; they helped me find a place to live and become acclimatized to the extreme weather... I would love for other Kenyans to learn from such a helpful team.**

Evans Okwaro (Physics Resident, 2016-2018)

BSc Radiation Therapy Training Program

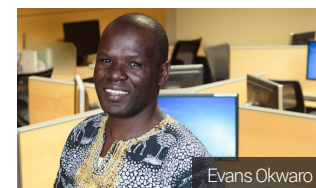
A MOU has been signed with Toronto Addis Ababa Academic Collaboration (TAAAC) to support the development of a BSc Radiation Therapy Training Program in Ethiopia. RMP will help to build training and clinical capacity in Ethiopia through 1-month teaching trips, three times a year. The first deployment of faculty from RMP is anticipated to occur in January 2019.

Radiation Seminar Series

The first virtual seminar was held in August 2017. The seminar series is designed to enhance the readiness of radiation therapists from Eldoret Comprehensive Cancer Centre to transition from 2D to 3D radiotherapy. Delivered by site-based teams of therapists, physicists and oncologists, fundamental concepts and practical tips are explained in the context of common malignancies in Kenya. Four Kenyan radiation therapists and three physics trainees are currently participating in this initiative.

Physics Residency Training Program

1 physics resident from Moi Teaching and Referral Hospital in Eldoret, Kenya has completed the 2-year training program at the Princess Margaret.



Evans Okwaro

Clinical Research Mentorship Program

2 radiation oncology residents from the Parirenyatwa Radiotherapy and Oncology Centre in Zimbabwe are currently participating in the program.

people

With a team of over 380 radiation specialists, RMP is fortunate to have a diverse pool of talent to increase the program's capacity to deliver on its vision to achieve "Precision Radiation Medicine. Personalized Care. Global Impact." In 2017-2018, RMP continued to exhibit excellence, innovation and leadership in patient-centred care, research and education, exemplified by the high level of productivity and achievements of our staff.

system leadership



Susan Awrey was elected to the Executive Committee of the Pediatric Radiation Oncology Society, effective May 2017



Jean-Pierre Bissonnette was appointed as the Physics Clinical Quality Lead with the Radiation Treatment Program at CCO, effective January 2018



Jennifer Croke was elected to the CARO Board of Directors



Barbara-Ann Millar was appointed as the Chair-Elect for the Radiation Oncology Specialty Committee with the Royal College of Physicians and Surgeons of Canada, effective July 2017

new talent

Radiation Oncology

Ali Hosni Ali Abdalaty, Aisling Barry, Benjamin Lok, Derek Tsang

Medical Physics

Kathy Mah

Radiation Therapy

Carmine Bozzelli, Jennifer Dang, Devin Hindle, Yasietha Krishnakulasingam, Alexandra Sarra, Simon Xie

Administration

Joanne Lawlor, Shima Marand, Lynn Nguyen, Matthew Ramotar, Cheryl Smith, Ayda Zokai

Clinical Research Program

Mahesh Kajil, Farah Khan

Welcome to all new hires!

sustained service

Congratulations and thank you to our dedicated RMP members who have reached their ≥25 year service milestone in 2017.

25 Years

Gary Chaulk, Ellen Hoffman, Michael, Milosevic, Tara Rosewall, Sandra Scott, Tu Huan Tran, Julie Wenz

30 Years

Anthony Fyles

35 Years

Laxmi Khemraj-Balram

40 Years

Mary Gospodarowicz, Gregory Thompson, Deborah Tsuji

Notable Awards and Distinctions

Marcia Bowen received the Ontario Volunteer Service Award (5-year category)

Kitty Chan received the Ontario Volunteer Service Award (15-year category)

Mary Gospodarowicz received the Women Who Conquer Cancer Mentorship Award from ASCO and the Conquer Cancer Foundation of ASCO

Sophie Huang was awarded the CAMRT Welch Memorial Lecturer Award

Nareesa Ishmail was awarded the UHN CAP/TAHSNp Oncology Program Health Professions Innovation Fellowship

Catarina Lam received the Certified Health Executive (CHE™) designation

Benjamin Lok received the International Association for the Study of Lung Cancer Young Investigator Award

Brian O'Sullivan was appointed as an ESTRO Honourary Member

Michael Velec received the CAMRT Early Professional Achievement Award

UHN Award Winners

Sherrill Archer, Jennifer Chau, Nareesa Ishmail, Kathy Lam, Kim Lam, Kevin LeNeve, Melanie Padiachy, Tatianna Ritchie, Jill Sellman, Kathy Yip were winners of the Princess Margaret Employee Engagement – Team Engaged Spirit Award

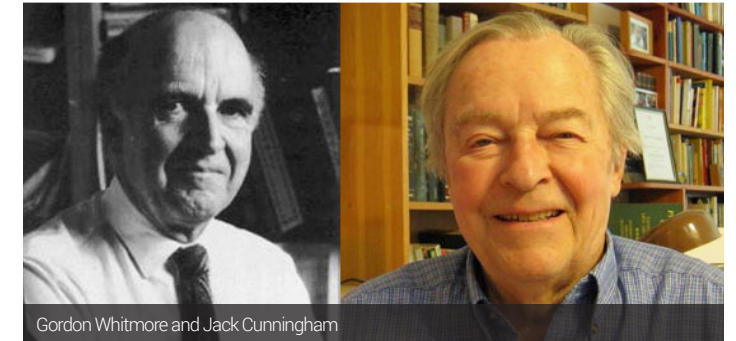
Marcia Bowen, Jasmine Hamilton and **Emily Milne** were recipients of the Princess Margaret Excellence in Cancer Education Support Award

Jack Cunningham and **Gordon Whitmore** were awarded the UHN Global Impact Award

Carina Feuz and **Anita Vloet** received the Princess Margaret Employee Engagement – Team Leadership Award



Emily Milne, Marcia Bowen and Pablo Munoz



Gordon Whitmore and Jack Cunningham



Kathy Yip, Jennifer Chau, Sherrill Archer, Melanie Padiachy, Marnie Escaf, Nareesa Ishmail, Tatianna Ritchie, Jill Sellman



Anita Vloet and Marnie Escaf

Benjamin Lok



Amy Parent, Alejandro Berlin, Michael Holwell, Jacqueline Maitland, Winnie Li, Kawalpreet Singh, Alana Pellizzari, Jean-Pierre Bissonnette, Tony Lam, Jason Xie, Sarika Gill

Notable Awards and Distinctions

RMP Award Winners

Research Awards:

Research Productivity – Radiation Oncology: **Meredith Giuliani**

Research Productivity – Medical Physics: **Douglas Moseley**

Research Productivity – Radiation Therapy: **Winnie Li**

Most Influential Research Publication: **David Hodgson**

Exceptional Research Support: **Lea Dungao, Sarika Gill, Janet Paterson, Kawalpreet Singh, Jason Xie**

Research Leadership Award: **Jean-Pierre Bissonnette**

Top Clinical Trial Accrual Investigator Award: **John Cho, Jolie Ringash**

Education Awards:

Chief's Choice RMP Rounds: **Charles Catton** and **Normand Laperriere**

Best RMP Rounds: **Alejandro Berlin**

Trainee Excellence in Education: **Fabio Moraes**

Excellence in Education Support: **Jacqueline Maitland**

Distinction in Teaching: RayStation Super Users (**Michael Holwell, Tony Lam, Amy Parent, Alana Pellizzari**)

Distinction in Professional Mentorship: **Laura Dawson**

Accelerated Education Program Awards:

Highest Overall Teaching Effectiveness Score: **Laura Dawson**

Putting Innovation to Work Award: **Bern Norrlinger**

Tributes

celebrating the career of a leader in oncology

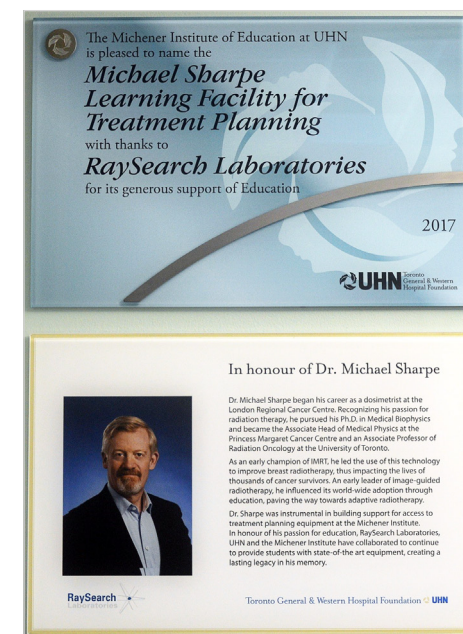
For almost two decades, **Robert Bristow** was an invaluable member of the Princess Margaret Cancer Centre as an internationally-renowned Radiation Oncologist Clinician-Scientist, and a Professor at the University of Toronto's Department of Radiation Oncology. His contributions to the field of prostate cancer genomics and tumour hypoxia have had an incredible impact on advancing cancer research and clinical care. In addition, he has mentored numerous residents and fellows; many of whom have gone on to assume important academic positions at various leading cancer institutions around the world, including the Princess Margaret and UTDRO.

RMP congratulated Dr. Bristow on his new position as University Professor of Cancer Studies in the Division of Cancer Sciences at the University of Manchester and Chief Academic Officer at the Christie NHS Foundation Trust in the United Kingdom with a Celebration Symposium in June 2017. The Symposium, entitled "Achilles' Heel Revisited: New Pathways and New Approaches to Combat Genetic Instability in Cancer", celebrated his achievements over the years, and the next chapter of his already successful career. The work of international leaders and researchers in the fields of cancer genomics and genetic instability were also featured.



remembering a friend and colleague

On June 9th, a Memorial Symposium and Tribute to **Michael Sharpe** was held at the Michener Institute of Education at UHN with over 170 people in attendance from across North America and Europe. The Symposium, themed "Forging Ahead in Medical Physics", explored emerging approaches to cancer care involving imaging and therapeutics; introduced novel informatics concepts, such as automation, optimization and machine learning; and described up and coming concepts such as MR-guided linacs and heavy particle therapy. The establishment of the Michael Sharpe Learning Facility for Treatment Planning at the Michener was announced with Dr. Sharpe's family and friends in attendance. The facility will honour his legacy and lifetime of achievements within radiation medicine.



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. Focusing on our four strategic pillars, we made strides in advancing cancer care on the local and global scale through research, pushed the boundaries in innovation, and contributed to enhancing practice through our award-winning education programs.

In the year ahead, we will build upon these achievements and work collectively towards implementing our Year-3 priority initiatives, bringing us one step closer to achieving our mission to “advance exemplary radiation medicine through patient care, research and education in partnership with our patients and community.” As the UHN, Princess Margaret and UTDRO undergo their strategic plan refresh, RMP will ensure its goals and directions remain aligned so we continue to be well-positioned to deliver transformative care and innovation within the changing landscape. By remaining true to our core values of innovation, excellence, collaboration, accountability and integrity, we will shape our program into one that delivers **“Precision Radiation Medicine. Personalized Care. Global Impact.”**

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RMP Quality Committee

RMP Research Committee

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- iv) 10.1038/nature20788
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