



25 YEARS OF EXCELLENCE



Radiation Oncology
UNIVERSITY OF TORONTO

DEPARTMENT OF RADIATION ONCOLOGY
ANNUAL REPORT 2015 - 2016

ANNUAL REPORT 2015- 2016

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Read our full-length report online at www.uoft.me/annualreport

VISION

INTERNATIONAL LEADERSHIP IN RADIATION ONCOLOGY, RESEARCH, EDUCATION AND PRACTICE

MISSION

WE PREPARE FUTURE RADIATION ONCOLOGY LEADERS, CONTRIBUTE TO OUR COMMUNITIES AND IMPROVE THE HEALTH OF INDIVIDUALS AND POPULATIONS THROUGH DISCOVERY, APPLICATION AND COMMUNICATION OF KNOWLEDGE

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DR. FEI-FEI LIU

CHAIR'S WELCOME

25 YEARS OF LEADERSHIP

Welcome to the University of Toronto's Department of Radiation Oncology (UTDRO) Annual Report for 2015-2016.

As we enter the 25th year of UTDRO, we are celebrating the thousands of people who have worked together to make UTDRO one of the most respected Radiation Medicine departments in the world.

Over the last 25 years, UTDRO has evolved from infancy to a department with strong educational programs and internationally-renowned faculty members. Our trainees are working around the world, sharing their clinical and research expertise, the results of which are having a tremendous impact on cancer care globally. We are now entering a new era in this evolution: our faculty and partner hospitals are investing time, funds and energy in leading biological and technological advances in Radiation Medicine, in a synergistic capacity. Throughout this annual report, you will see examples where UTDRO faculty members are leading the medical and scientific evolution of cancer care.

Our department's successes would not be possible without our talented faculty and outstanding trainees. I am proud to call each of the individuals profiled in this report my colleagues. I am also proud to welcome 16 new faculty members to the UTDRO family – one that has grown to several thousand individuals, making their impact around the world.

I also want to remember Dr. Michael Sharpe who passed away this year. He was a brilliant physicist, a colleague and a friend to all of us at UTDRO and beyond. Our sympathies and best wishes go out to his family, friends and colleagues.

Our department is still very young, yet it has a strong role to play in transforming cancer care around the world. Not only is our Fellowship Program well-known around the world, our residency programs also garner great respect from our national

and international colleagues. In this report, you will read about the impact of UTDRO in growing the Radiation Medicine profession in Canada. I anticipate that in the coming years, our reputation as an academic department will continue to grow. Of course, this is not possible without a firm support system for our students and learners. I encourage you to continue to support the BJ Cummings Award for Research Excellence, and the Pam Catton Award for Interprofessional Education.

Lastly, I would like to extend my gratitude to our current Vice Chairs, Drs. Michael Milosevic, Rebecca Wong, and Shun Wong for their counsel, assistance and support of our initiatives. I would also like to give a special shout-out to Dr. David Jaffray, UTDRO's previous Vice Chair of Research, for his years of advice and oversight. My thanks also to our Executive Team for their commitment and hard work in deploying our programs, and supporting our trainees. None of this would be possible without the UTDRO administrative team who work tirelessly behind-the-scenes to ensure the smooth operation of our department.

Please browse through the 2015-2016 Annual Report and stay in touch with us online through our various social media channels.

Thank you,

Dr. Fei-Fei Liu, MD, FRCPC
Chair and Professor
Department of Radiation Oncology

VICE CHAIR REPORT

EDUCATION

DR. REBECCA WONG
VICE CHAIR, ACADEMIC AFFAIRS



UTDRO is home to a comprehensive range of training programs in Radiation Medicine. Our mission is dedicated to the training of our leaders of tomorrow.

The Joint BSc and Advanced Diploma in Radiation Therapy, Radiological Technology, and Nuclear Medicine and Molecular Imaging Technology in Medical Radiation Sciences welcomed its combined class of 102 students. The integration of the Michener Institute with University Health Network in January 2016 created a strengthened environment for innovative curriculum for the health care of tomorrow. Our Postgraduate Residency in Radiation Oncology celebrated the leadership of Dr. Barbara-Ann Millar, as she assumes the role of Chair-Elect for the Royal College Radiation Oncology Specialty Training Committee. As such, she has passed the baton as Program Director of the largest training program in Canada to Dr. Andrea Bezjak in September 2016. Dr. Bezjak will be preparing the transition to competency based training, creating even greater opportunities for enriched learning.

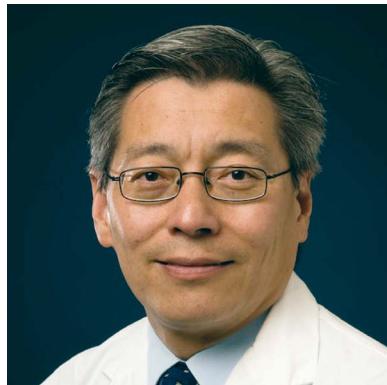
Our trainees continue to pursue a wide range of academic interests with demonstrated achievements in radiation sciences, education and global health. Our Postgraduate Medical Physics Residency celebrated the accomplishments of Dr. Jean-Pierre Bissonnette who completed his term as Director in February 2016, and UTDRO welcomed Dr. Andrea McNiven to lead the program into the next phase. Our Fellowship Program in Radiation Oncology welcomed 26 fellows from around the world pursuing specialty areas as well as graduate degrees. The MHSc in Radiation Therapy underwent a major curriculum redesign to position itself in attracting top Canadian and International candidates; providing new leadership and research streams in addition to its established clinical specialization pathway. It welcomed its new class of 3 students in 2016. STARS21, formerly EIRR21, secured additional funding from TFRI, along with matched institutional funding; its alumni continue to contribute to research capacity in Radiation Medicine across Canada.

Our faculty continues to make significant contributions to the U of T undergraduate medical education curriculum, as well as supervision for MSc and PhD candidates in Radiation Medicine, Medical Biophysics and Clinical Epidemiology. The Annual UTDRO Radiobiology Course (attended by 36 participants in 2015) is an exceptional course for radiation oncology and physics residents as well as graduate students, fulfilling the curriculum for the Royal College Certification Exam.

Continuous professional education at UTDRO takes on many different forms. The Accelerated Education Program continues to build innovative curriculum; teaching ahead of and beyond the curve. The liver course attracts participants from around the world, while SBRT in Advanced Cancer is our latest addition. The Executive Personalized Learning Program welcomed 5 learners from China and Spain, providing individualized learning experiences through observership, tutorials and immersion in our practice culture. RTi3 has established itself as an international event in Radiation Therapy and welcomed 178 delegates in 2015. UTDRO Journal Club was launched in January 2016; each of its events are designed to showcase collaboration across our clinical sites and the resulting innovation from UTDRO.

External educational awards bestowed upon our trainees and faculty provide an opportunity to celebrate our teachers, students and the quality of our education. Highlights include the Faculty of Medicine PGME Trainee Leadership Social Responsibility Award – Dr. Danielle Rodin (2015); CARO Resident Jean Roy Memorial Award – Dr. Danielle Rodin (2015); CARO – CIC Radiation Oncology Global Health Scholarship – Dr. Horia Vulpe (2016); MASCC/ISOO Young Investigator Award – Dr. Srinivas Raman (2016); The Canadian Medical Association (CMA) Award for Young Leaders – Dr. Meredith Giuliani (2016); The American Association of Physicists in Medicine (AAPM) Innovation in Medical Physics Education Award – Dr. Marco Carbone & Ms. Nicole Harnett (2016).

VICE CHAIR REPORT



CLINICAL AFFAIRS

DR. SHUN WONG

VICE CHAIR, CLINICAL AFFAIRS

UTDRO continues its regional leadership role in advancing radiation treatment and cancer care for the province of Ontario. Staff at the Odette and Princess Margaret Cancer Centres, as well as our affiliated staff at Southlake Regional Health Care, Trillium Health Partners, Royal Victoria Hospital and Lakeridge Health continued their contributions in creative professional and teaching activities. Radiation Oncologists in the Department continued to provide educational and multidisciplinary tumor board support, as well as outreach consultations to our community-affiliated and community hospitals.

Clinical volumes remained stable at the Princess Margaret and Odette with ongoing upgrades of radiation planning and treatment units, as well as information and imaging systems. Both radiation programs also benefited from strong philanthropic support from their respective hospital foundations.

New appointments in 2015-2016 included Steven Babic, Alejandro Berlin, Charles Cho, Jennifer Croke, Krista Dawdy, Louis Fenkell, Anthony Kim, Renee Korol, Natalie Lauzon, Nadiya Makhani, Sten Myrehaug, Amir Owrange, Joe Presutti, David Shultz, Angela Turner and Jason Wong. Dr. Cyril Danjoux retired after many years of services at Odette; we also bid farewell to Dr. Caroline Chung who moved to MD Anderson Cancer Centre. Dr. Anthony Brade left University Health Network to become the Head of the Radiation Treatment Program at the Carlo Fidani Regional Cancer Centre, Trillium Health Partners. UTDRO was saddened by the passing of Professor Michael Sharpe, an internationally respected medical physicist, endearing friend and cherished colleague after a brief and hard-fought battle with cancer.

Many faculty members were honored for their outstanding work and contributions to Radiation Oncology and cancer care. Dr. Mary Gospodarowicz was awarded the 2016 Canadian Cancer Society Research Institute Harold Warwick Prize in recognition of her contributions in cancer control. Dr. Laura Dawson was named one of the ten 2016 Fellows of ASTRO for her outstanding work in the field of hepatobiliary radiation therapy. Dr. Marianne Koritzinsky was awarded the Michael Fry Award by the Radiation Research Society. Dr. Barbara-Ann Millar ended her term as Director of the Radiation Oncology Residency training program to take on her role as Chair-Elect for the Radiation Oncology Specialty committee at the Royal College of Physicians and Surgeons. Dr. Meredith Giuliani was the recipient of the 2016 Canadian Medical Association (CMA) Award for Young Leaders. Many other members received awards from local, national and international professional bodies for their contributions as detailed in UTDRO News.

Lastly, we offer congratulations to Dr. Alex Sun and Dr. Thomas Purdie for their successful academic promotion to the rank of Associate Professor effective July 1, 2016.

VICE CHAIR REPORT

The University of Toronto Department of Radiation Oncology and its affiliated academic hospitals and radiation treatment programs comprise one of the largest and most productive academic radiation medicine programs worldwide. UTDRO research drives innovation along the entire patient journey from diagnosis through treatment to end-of-life care and long-term survivorship. Key research themes include bio-physical tumor targeting to enhance the effectiveness of radiotherapy; innovation in the treatment of patients with recurrent or metastatic disease; the development of new strategies for managing treatment side effects and regenerating injured tissues; and learning from all patients by capitalizing on comprehensive clinical, biological, dosimetric and outcomes 'big data' repositories.

Academic 2015-16 was a banner year for UTDRO, with numerous high-impact publications and continued growth in the number and breadth of collaborative programs both within the UTDRO academic family and externally on a national and international scale.

There were a total of 383 peer-reviewed research publications by UTDRO faculty in 2015-16, including 40 in journals with impact factors >10. This represents a 15% increase in the number of publications from 2014-15 and also a substantial increase in the proportion of high-impact publications. Of note, radiation therapists were the lead authors of a significant number of papers in 2015-16, which speaks to the interdisciplinary, collaborative nature of the UTDRO research environment. Key high-impact publications in 2015-16 illustrative of the richness and diversity of UTDRO research include:

RESEARCH

DR. MICHAEL MILOSEVIC VICE CHAIR, RESEARCH



- Spatial genomic heterogeneity within localized, multifocal prostate cancer
Nature Genetics 2015
Lead author: Rob Bristow
- Dexamethasone in the prophylaxis of radiation-induced pain flare after palliative radiotherapy for bone metastases: a double blinded, randomized placebo-controlled, phase 3 trial
The Lancet Oncology 2015
Lead authors: Edward Chow and Rebecca Wong
- Global Task Force on Radiotherapy for Cancer Control
The Lancet Oncology 2015
Lead authors: Mary Gospodarowicz and David Jaffray
- Response assessment after stereotactic body radiotherapy for spinal metastasis: a report from the SPIne response assessment in Neuro-Oncology (SPINO) group
The Lancet Oncology 2015
Lead author: Arjun Sahgal
- Refining American Joint Committee on Cancer/Union for International Cancer Control TNM stage and prognostic groups for human papillomavirus-related oropharyngeal carcinomas
Journal of Clinical Oncology 2015
Lead authors: Sophie Huang and Brian O'Sullivan

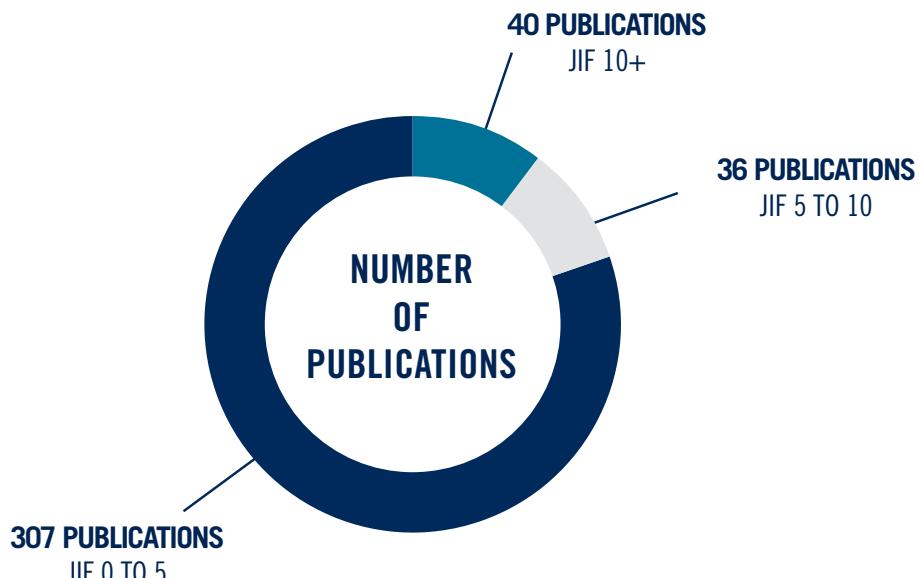
The total peer-reviewed grant support available to UTDRO investigators in 2015-16 was \$47.5M. This included two prestigious Terry Fox New Frontiers Team grants, one focused on hypoxia-directed precision cancer medicine and the other on ultrasound and MR imaging for cancer therapy. New grants were awarded to RMP investigators from the Canadian Foundation for Innovation (CFI), Canadian Institutes of Health Research (CIHR) and other competitive funding bodies to support research in diverse areas, including the development of integrated systems-level imaging, palliative radiotherapy for liver tumors and epigenetic reprogramming of radiation-induced fibrosis. Again in 2015-16, two internal, peer-reviewed seed grants were awarded to promote collaboration within the UTDRO community.

Overall, the research conducted by UTDRO investigators is driving innovation and practice evolution in radiation medicine on a global scale. Currently, there is unprecedented potential to further improve clinical outcomes by exploiting patient-centric synergies at the interface between biology discovery and technology advancement. UTDRO is ideally positioned to capitalize on these opportunities because of its adaptability and diversity, including its strong educational programs that facilitate rapid translation of new knowledge to clinical practice.

UTDRO RESEARCH HIGHLIGHTS



Note: This total funding includes funding for Principle Investigators and Co-Principle Investigators only and excludes large infrastructure grants.



JIF = Journal Impact Factor

WELCOMING NEW FACULTY MEMBERS

16 new faculty members joined UTDRO in 2015-2016. They represent various disciplines and bring a wealth of experience and skill-set with them.



DR. STEVEN BABIC

Dr. Steven Babic is a Medical Physicist and Deputy Lead for external beam radiation therapy at Odette Cancer Centre. In 2014, he led the clinical implementation of Odette's photodynamic therapy (PDT) program that offers eligible patients an additional treatment option for pre-cancerous and superficial skin cancer lesions. He is presently working on integrating fluorescence imaging and optical computed tomography into the clinic for patient-specific PDT dosimetry. His research interest lies in developing and implementing a clinical gel dosimetry system that will enable accurate volumetric dose verification and quality assurance of the novel MRI-Linac.



DR. ALEJANDRO BERLIN

Dr. Alejandro Berlin is a clinician-investigator and a radiation oncologist at the Princess Margaret Cancer Centre. His clinical focus is in the treatment of central nervous system and genitourinary malignancies with personalized approaches combining systemic, external beam radiation and brachytherapy treatments. His main research interests are in innovative clinical trial design, novel imaging methods and MR-guided therapeutics including brachytherapy, and translational oncology focused on the development of novel genomic-based biomarker



DR. JENNIFER CROKE

Dr. Jennifer Croke is a clinician-investigator and a radiation oncologist at the Princess Margaret Cancer Centre. Her clinical and research areas focus on gynecological malignancies and breast cancer. In particular, she is developing guidelines for radiation therapy quality indicators for locally advanced cervical cancer, as well as evaluating the use of patient-reported outcomes in clinical practice for cervix cancer patients. Additionally, she has an interest in education and teaching, and is currently completing a Masters of Medical Education through Maastricht University.



DR. LOUIS FENKELL

Dr. Louis Fenkell is a Radiation Oncologist at the Stronach Regional Cancer Centre and the Princess Margaret Cancer Centre. His interests include investigation of novel techniques and technologies for the treatment of prostate and breast cancer that allow for improved cancer targeting and reduced side effects. He is the Cancer Care Ontario Radiation Oncology Prostate Cancer Champion for the Central LHIN.



DR. ANTHONY KIM

Dr. Anthony Kim is a Medical Physicist at the Odette Cancer Centre. He leads various clinical developments in treatment planning at Odette, such as the clinical implementation of the flattening filter free beam, and testing and implementation of the Monaco treatment planning system. His research interests are focused on the upcoming MR-Linac; examining issues such as inter- and intra-fraction motion, and its management using adaptation with MR images, deformable image registration quality assurance, and robust planning strategies to manage dose perturbation at air-tissue interfaces due to the magnetic field.



DR. RENEE KOROL

Dr. Renee Korol is the lead physicist for the stereotactic body radiation therapy program at Odette Cancer Centre. Her research interests span from assessing different treatment planning strategies to target localization for SBRT patients with a special interest in GI and oligometastases. This includes the assessment of PTV margins, organ motion and the impact of various immobilization devices. Her vision is to further improve efficiency throughout the treatment process and to integrate MRI.



MS. NADIYA MAKHANI

Nadiya Makhani is a Radiation Therapist working as a Dosimetrist since 1986 at Odette Cancer Centre. With over 40 years of expertise, Nadiya's teaching has been recognized with 3 Golden Apple Clinical Teaching Awards. She specializes in clinical teaching of the Treatment Planning curriculum to Medical Physics and Radiation Oncology residents. Her research includes breast and CNS team innovations.



DR. AMIR OWRANGI

Dr. Amir Owrangi is a Medical Physicist at the Odette Cancer Centre (Odette). His research interests lie in the clinical implementation of MRI in brachytherapy, as well as developing image processing methods used for generating synthetic CT images from MR images, that can in turn be used for MR-only treatment planning. He is currently co-supervising research assistants in brachytherapy treatment planning specifically focusing on inverse optimization and Monte Carlo simulation, as well as patient outcome assessment.



MR. JOE PRESUTTI

Joe Presutti is a Radiation Therapist currently employed at Odette Cancer Centre in Treatment Planning. Joe is also the department's Clinical Educator for Treatment Planning. He specializes in clinical teaching of treatment planning to the Medical Physics and Radiation Oncology residents. His recent research contributions include cardiac dose determination during treatment of breast cancer.



DR. JASON WONG

Dr. Jason Wong is a Radiation Oncologist at the Stronach Regional Cancer Centre at Southlake Regional Health Centre and the Princess Margaret Cancer Centre/University Health Network. His clinical and research interests are in breast, gastrointestinal and genitourinary cancers as well as in health services research.

We also welcomed the following individuals to our faculty: Dr. Charles Cho at Southlake Regional Health Centre, Ms. Krista Dawdy at Odette, Ms. Natalie Lauzon at Odette, Dr. Sten Myrehaug at Odette, Dr. David Shultz at the Princess Margaret and Ms. Angela Turner at Odette Cancer Centre.



25 YEARS OF MEMORIES

Above: Michael Sharpe

Dr. Michael Sharpe (February 3, 1965 - June 22, 2016), an internationally respected medical physicist, endearing friend and cherished colleague, passed away on the afternoon of June 22, 2016 after a brief but hard-fought battle with esophageal cancer.

Dr. Sharpe was an Associate Professor at UTDRO and the Department Mechanical and Industrial Engineering at the University of Toronto. He was also the Associate Head of Medical Physics (Professional and Academic Affairs) in the Radiation Medicine Program at the Princess Margaret Cancer Centre and an Affiliated Faculty of the Techna Institute. Our thoughts and condolences are with his wife Jane, his two lovely children – Gregor and Emily, as well as his parents, siblings, nieces and nephews.

REMEMBERING MICHAEL SHARPE

A DEDICATED COLLEAGUE, MENTOR AND FRIEND

Mike's amiable nature, piercing intellect and engaging persona created a remarkable network of friends, colleagues and mentees that transcends time and space. His loss was felt the world over. "Mike was an absolute gem! He was uber-smart; exceptionally knowledgeable and analytical, and called it as he saw it," recalls UTDRO Chair, Dr. Fei-Fei Liu. "I could always count on Mike to give me an accurate and honest assessment of any situation; he was never one to sugarcoat the message... and for that, I will always be deeply grateful. Mike will be deeply missed by everyone within our communities."

Mike joined UTDRO and the Princess Margaret Cancer Centre in 2002 and worked tirelessly to advance the technology and practice of radiation therapy. Today, his innovations and inventions directly benefit cancer patients worldwide. Mike

MIKE'S AMIABLE NATURE, PIERCING INTELLECT AND ENGAGING PERSONA CREATED A REMARKABLE NETWORK OF FRIENDS, COLLEAGUES AND MENTEES THAT TRANSCENDS TIME AND SPACE

was recruited back to Canada from William Beaumont Hospital in Royal Oak, Michigan, where he led the development of intensity modulated radiotherapy techniques for breast cancer patients and was a central part of the team that invented the active breathing control system for precision radiotherapy. Both of these developments are employed worldwide for the benefit of many patients. Mike was 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 course of his career, he authored over 60 peer-reviewed publications, as well as numerous chapters in the field of radiotherapy.

Despite his efforts to stay out of the lime light, Mike was recognized for his contributions on many occasions, including receiving Cancer Care Ontario's Innovation Award in 2007 and the University Health Network's Inventor of the Year Award in 2009. In 2015, Mike became a Fellow of the American Association of Physicists in Medicine in recognition for his many significant contributions to the field of Medical Physics. In the very brief time since his passing, the global radiation medicine community has responded with numerous statements of condolence and accolades of his impact on the field. UTDRO faculty Nicole Harnett remembers Mike fondly, "Mike was an inspiration, a mentor, a safe haven and a willing co-conspirator. As has been said about Mike many times, he was a masterpiece in the making – a piece of art that, while not quite done, made you better for having been able to share in its making anyway."

Mike had a passion for teaching and a natural skill in mentorship. As a seasoned Medical Physicist, he was often approached by trainees and staff, and he took his role as mentor seriously. His passion for rigor and clarity brought immeasurable benefit to the profession of Medical Physics and to the patients these individuals served. Mike continued this effort at scale by serving as the Quality Leader of Cancer Care Ontario's Radiation Treatment Program. Mike's animated and engaging teaching skills were sought after by many. He delivered lectures on advanced radiotherapy techniques to medical physicists, radiation oncologists and radiation therapists in local courses as well as in invited lectures around the world. To this end, he was 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 Michael's dedication to his family and his profession, he had an incredible passion and talent for cycling. After having discovered cycling just over 10 years ago, Mike took on a central role in the establishment of the RMP Accelerator team in the annual Ride to Conquer Cancer (RTCC) at the Princess Margaret. As team co-captain, Mike recruited many friends and colleagues to the wonderful sport of cycling. His charming and passionate personality was as effective at raising funds as he was at recruiting. Although Mike knew his fate was sealed, he still signed up for the 10th anniversary of the RTCC in 2017 - a leader to the end.

Mike will be dearly missed by his friends and coworkers at UTDRO and by his many colleagues from around the world.



25YEARSOFEDUCATION

THE SARCOMA APP USING TECHNOLOGY TO ENHANCE LEARNING

When radiation therapists want to learn about a rare disease such as sarcoma, they turn to Clinical Radiation Oncology, which is one of the only textbooks to address this topic.

"I wanted to do something different," said Colleen Dickie, an Assistant Professor at UTDRO and a Radiation Therapist at the Princess Margaret. Therefore, Colleen created the world's first sarcoma app "to disseminate evidence-based knowledge about this rare disease and to enhance the way people learn about sarcoma."

Since soft tissue sarcomas are rare and radiation therapy techniques are constantly changing and improving, it is difficult to standardize treatment. "There is no common method to position patients for sarcoma treatment and there is no common imaging method or radiation therapy technique," explained Colleen.

In parallel, Cancer Care Ontario has launched a province-wide initiative, called the Provincial Sarcoma Services Plan, which will centralize sarcoma care. Presented as a hub and spoke model, the plan had tasked major centres such as

THE SELF-DIRECTED LEARNING PLATFORM TARGETS RADIATION THERAPISTS WORKING WITH SARCOMA, STUDENTS LEARNING ABOUT RADIATION THERAPY AND OTHERS WHO ARE INTERESTED IN LEARNING ABOUT TREATMENT FOR THIS DISEASE

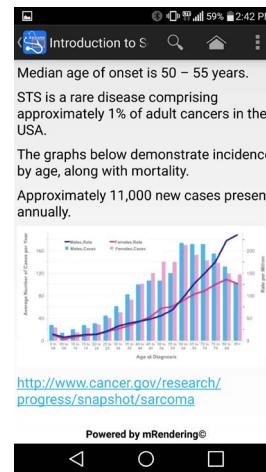
the Princess Margaret to provide several services such as disseminating evidence-based knowledge to help deliver high-precision radiation therapy. Colleen's sarcoma app aligns with this goal perfectly.

The app is meant to be launched in centres around the world where radiation therapists are treating soft tissue sarcoma. The self-directed learning platform targets radiation therapists working with sarcoma, students learning about radiation therapy and others who are interested in learning about treatment for this disease.

Given the common and widespread use of cell phones today, an app-based educational platform was the perfect medium for this community. Once downloaded, it is capable of operating without a wifi connection, is easy to update and free to use. "It is the perfect addition to lectures," added Colleen. "But it was not an easy project to develop."

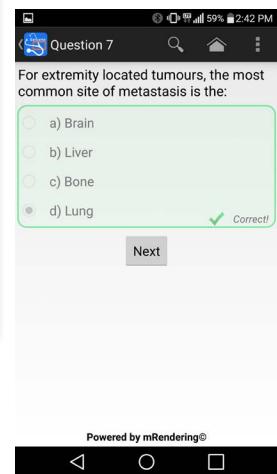
After receiving a \$5,000 CAMRT Research Grant, Colleen devised a system that was affordable and easy to update. She employed a development company called mRendering who had a track record of creating high-security apps for the United States military. Colleen then negotiated with the company to develop the sarcoma app at a discounted price in exchange for her input on their e-learning platforms.

Colleen learned about the intricacies of creating and launching apps while the developers learned about e-learning theory. She worked with the entire Radiation Medicine team and sourced content from their publications. She got input from UTDRO radiation oncologists and within a year, the first version of the app had been released to Medical Radiation Sciences undergraduate students. "I am testing it with the students,"



<http://www.cancer.gov/research/progress/snapshot/sarcoma>

Powered by mRendering®



Powered by mRendering®

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Above: Screen shots from the Sarcoma App

Colleen said. "Based on the data and their feedback, we will continue to work out the bugs. Then we will release it within the Radiation Medicine Program, followed by provincial, national and international deployment." Colleen already has interest from centres around the world including MD Anderson Cancer Center in Texas, Memorial Sloan Kettering Cancer Centre in New York and the Netherlands Cancer Institute.

The app tests the user's knowledge before and after each 'chapter' and provides reference material which the user can use to verify information and familiarize themselves with the required sources for their daily work. Pilot testing shows that students are engaging with the app and their knowledge about sarcoma is increasing.

Colleen hopes that this app will open up the channels of communication between the various centres so they can all share their techniques and decide on the best treatment options together. It has already brought an inter-disciplinary team of medical physicists, radiation oncologists, radiation therapists and e-learning specialists together at the Princess Margaret. After releasing it nationally, Colleen plans to expand the app to include sections on medical oncology, surgical oncology and young adults, as well as a patient section where the patients will be able to complete assessments while they await treatment.

The Sarcoma app will be available for free download on Apple and Android devices at the end of this year.

WILLIAM CHU

LEADING INNOVATIONS IN RADIATION MEDICINE

According to Dr. William Chu, “treatment techniques can always be made better and re-assembled to improve patient outcome.” He is referring to his latest efforts to combine MR imaging with therapeutic ultrasound and radiation to treat patients with recurrent rectal cancer.

William Chu is an Assistant Professor at UTDRO and a Radiation Oncologist at the Odette Cancer Centre. Following his residency and fellowship in Radiation Oncology at UTDRO, he joined Odette as a Radiation Oncologist specializing in gastro-intestinal and genitourinary malignancies.

It was his interest in imaging that led to his latest innovative therapeutic intervention, MR-guided high intensity focused ultrasound (MRg-HIFU) hyperthermia for recurrent rectal cancer. “We know that heating a tumour makes it more sensitive to radiation therapy,” William explained. “So we use ultrasound to heat the tumour with the help of real-time MR guidance for targeting visualization and thermometry; we then treat the tumour with radiation.”

Patients with recurrent rectal cancer are traditionally treated with a combination of radiation and chemotherapy, and surgery when possible. For tumours that cannot be treated surgically, MRg-HIFU hyperthermia potentially increases the

THE INNOVATION WAS TO COMBINE HIGH-INTENSITY FOCUSED ULTRASOUND WITH REAL-TIME MR IMAGING TO HEAT THE TUMOUR.

likelihood of the tumour responding to chemotherapy and radiation. This may reduce the need for ongoing treatment for patients with recurrent rectal cancer.

William noted that heating tumours to increase their response is not a new concept. The innovation was to combine HIFU with real-time MR imaging to heat the tumour. “We worked with our technology partner, Philips Healthcare,” William said. “They helped us refine the MR imaging table with an ultrasound transducer so that we could heat a target deep in the body while visualizing and measuring

the heat intensity.” The MRg-HIFU unit was optimized to administer lower heat over a longer period of time. This gentle heating is safer for the surrounding tissues and is then followed by radiation therapy to the tumour.

“With MR imaging, we are obtaining real-time information about the tumour,” William explained. “We can verify that we are hitting the target and precisely measuring its temperature in three-dimensions – all of this information was not available to us with previous hyperthermia treatment platforms.”

William’s team, comprised of researchers at Philips and the Sunnybrook Research Institute, recently launched the first phase of a feasibility study of this treatment for patients with recurrent rectal cancer. If the results of the study are positive, William hopes to extend this technology to the clinic to treat patients with newly diagnosed rectal cancer and other tumour types.

In addition to this study, William is busy as the Canadian lead of an international phase III clinical trial of stereotactic ablative body radiotherapy (SABR) for prostate cancer. The Prostate Advances in Comparative Evidence (PACE) study is being led by the Royal Marsden and is taking place at 15 cancer centres across Canada.



25 YEARS OF INNOVATION

Above: William Chu

"This trial will define the next step in the evolution of prostate cancer treatment," William said. Instead of the standard 20 to 39 treatments of radiation, the team is delivering five treatments with higher doses. Studies to date have shown SABR to be a promising and effective treatment with no increase in damage to the tissues around the prostate. "This treatment is potentially a new standard for prostate cancer care," William added.

William credits UTDRO for enabling his research. "We have the opportunity to 'move the needle' in Radiation Medicine. We are very fortunate at UTDRO to have the infrastructure and resources to take the next steps to discover new and innovative treatments."



25 YEARS OF COLLABORATION

Standing (L to R): Christopher Townsend, Igor Gemchuk, Darby Erler, Arjun Sahgal, Lisa Di Prospero
Sitting (L to R): Minoli Mendis, Hany Soliman, Alex Karotki, Renee Korol, Dennis Miller

SBRT E-LEARNING PLATFORM DEVELOPING NEW LEARNING TOOLS AT ODETTE CANCER CENTRE

If you have been working as a radiation therapist for around 20 years, chances are that you did not learn about Stereotactic Body Radiation Therapy (SBRT) in school. You may have picked up bits of information about this new and rapidly changing technology from conferences and time spent in the clinic.

The non-uniform way that radiation therapists, radiation oncologists and medical physicists are learning about SBRT has resulted in a knowledge base that varies for each individual. In addition, the decisions about and access to SBRT dose guidelines are usually regional – what is acceptable in one region may not be the case in a different region.

ON THE TEAM, EACH PERSON HAD AN AREA OF EXPERTISE AND THEY EACH BROUGHT THEIR OWN PERSPECTIVE TO THE CONTENT

Interprofessional faculty members at the Odette Cancer Centre wanted to ensure that all their clinicians and learners have the same level of knowledge about SBRT. So they approached their vendor Elekta, to collaborate on a standard learning platform that can be shared with existing clinicians and incoming learners.

Through a unique interprofessional partnership consisting of radiation oncologists, radiation therapists, medical physicists, e-learning technologists and Elekta, an e-learning series about SBRT was launched. For the first time ever, all clinical staff and trainees at Odette now have the same level of knowledge about SBRT.

UTDRO Assistant Professor Lisa Di Prospero is the professional leader and manager of research and education for radiation therapy at Odette. She said that this e-learning series “ensures that everyone has the same background foundation when they come to the clinic. We also embed it in the orientation for therapists who are coming to the SBRT unit.” By launching the e-learning series instead of traditional lessons, the educators at Odette now have a larger and more engaged audience, and the flexibility to push new guidelines and materials to this audience.

Darby Erler, who is an Instructor at UTDRO and a clinical specialist radiation therapist (CSRT) at Odette, assembled the content for this e-learning series. “Most of the content was created with help from faculty at

UTDRO, namely medical physicists and radiation oncologists and clinical experts from Elekta”, she explained. “We also referenced papers on SBRT and international and national guidelines.” One of the benefits of using an e-learning platform is that key references to seminal papers were provided so that the learners do not have to look for the research on their own. While they go through the series, they can access these papers and publications if they wish to obtain more information.

Learners are advised to go through the four modules in order, but they can skip a section or go back to a section depending on their knowledge base. “The first module speaks about what is required to deliver SBRT safely, followed by modules on planning, treatment, and then case examples to illustrate the concepts,” adds Darby.

The e-learning series launched in 2016 after a year and a half in development. Elekta’s Global Education & Training Development Manager, Dennis Miller, explained the challenges in creating this e-learning series. “We had to take a highly technical subject and make it applicable to a wider audience. It had to be fun, accessible and exciting.”

Early evaluations show that clinical staff are using it to update their knowledge on SBRT and referring back to it for specifics. This was evidenced by learner feedback as highlighted by Mikhael Quasalmy, junior radiation therapist at Odette: “The e-learning

modules provided me with an excellent overview of SBRT prior to starting a rotation on the SBRT treatment unit. The interactive examples really helped clarify the key concepts for me.”

Having an interprofessional team behind this project has been instrumental. Dr. Hany Soliman, Assistant Professor at UTDRO and Radiation Oncologist at Odette, added that “this project was designed by and for learners in all three disciplines – radiation oncology, medical physics and radiation therapy. It is suitable for both beginners as well as learners who have a more advanced knowledge of SBRT”.

On the team, each person had an area of expertise and they each brought their own perspective to the content. The physicists were the technical experts, therapists thought about the patient experience, the oncologists understood the clinical outcome; and the e-learning technologists made the whole package interactive and accessible. Lisa added that “this type of collaboration with industry partners and clinical staff is really the first of its kind.”

Dennis hopes that this type of e-learning can be taken to emerging markets such as India and Africa. Meanwhile at Odette, the education leads are working to include this e-learning series in the curriculum for incoming trainees and clinicians as a formalized core component of the learning pathway.

BRIAN O'SULLIVAN

ADVANCING RADIATION MEDICINE



25 YEARS OF INSPIRATION

Above: Brian O'Sullivan

Dr. Brian O’Sullivan’s career spans a series of inspiring successes, but he will be the last person to tell you that. You may know him as the co-creator of one of the world’s leading sarcoma programs or heard him at one of his countless speaking engagements; you may have followed his 300-plus peer reviewed publications or his groundbreaking research on how to treat tonsillar cancer including frontier research on understanding clinical behavior and optimizing treatment for human papillomavirus (HPV)-related oropharyngeal cancer. However, Brian wants to be known first, as a physician working with patients in the clinic, and then as a researcher connecting the world through education.

Dr. Brian O’Sullivan is a Professor in the University of Toronto’s Departments of Radiation Oncology (UTDRO) and Otolaryngology. He is also a Radiation Oncologist at the Princess Margaret, where he leads the Radiation Oncology Sarcoma Site Group and the institute’s head and neck site team. He holds the Bartley-Smith/Wharton Chair at the Princess Margaret in addition to his Clinician-Scientist appointment with the Ontario Association of Radiation Oncologists.

Growing up as the son of a diplomat, Brian had spent time in several places around the world before settling down to attend the Clongowes Wood College, a renowned Jesuit school in Ireland. In addition to rugby, he developed a passion for medicine which brought him to the medical school at the National University of Ireland, University College, Dublin. In 1975, while on an elective as a medical student, Brian visited the United States and met oncologists trained at the Princess Margaret. Intrigued by their profound knowledge base, Brian decided to visit the Princess Margaret later that year and subsequently enrolled in the medical oncology fellowship program there.

OVER THE YEARS, A LOT OF OPPORTUNITIES CAME ABOUT BECAUSE, I HOPE, I WAS A LITTLE OBSERVANT AND NOT TOO DOGMATIC. I TRY TO INSTILL THIS PHILOSOPHY IN APPROACH TO THE RESIDENTS AND FELLOWS.

During his medical oncology fellowship, radiation oncologists including UTDRO’s past chair, Dr. Bernard Cummings, encouraged Brian to pursue a career in radiation oncology. Thus, after completing his fellowship, Brian joined the radiation oncology residency program in 1980, and followed that up with a clinical fellowship in radiation oncology.

While he was working at McGill University in 1985, he received a phone call that would profoundly change his career. Brian was invited by an established and well-published radiation oncologist, Dr. Andy Harwood, to take over his practice in head & neck and sarcoma at the Princess Margaret. Even though Brian has taken on numerous projects and leadership roles since then, he has continued with his head & neck and sarcoma practices to this day.

Dr. Bob Bell, the current Deputy Minister of Health at the Ontario Ministry of Health and Long-Term Care, worked closely with Brian in the 1980s. They focused on the lack of sarcoma academic and clinical programs and set out to enhance sarcoma programs across the province. Although the Princess Margaret Sarcoma Site Group already existed as a clinical program, Dr. Cummings established it as an academic program in 1986, with Brian as its head. It is now one of the leading sarcoma programs in the world. “We are quite proud of this program as it guides

teaching and practice globally,” said Brian. “It focuses on multidisciplinary care that is underpinned by excellent collaboration in the clinic between surgical oncology, medical oncology, pathology and medical imaging. Through this program, we have published major papers and influenced sarcoma care in many areas.”

In the early 1990s, when funding for health care was drying up in Ontario, UTDRO was established at the University of Toronto. “Against all odds, Bernard was able to gather support and backing to establish UTDRO,” recalled Brian. As one of the first members of UTDRO, Brian noted that the Radiation Medicine team has come a long way in the last 25 years. “There have been a lot of changes, but we have continued to work as a group. The support, respect and collegiality have ensured that we continue to do brilliant work as a team.”

In 2008, Brian became the Head of the head & neck site group at the Princess Margaret. “Serendipity played a big role in my career trajectory,” he recalled. “I did not plot a straight path to this point. Over the years, a lot of opportunities came about because, I hope, I was a little observant and not too dogmatic. I try to instill this philosophy in approach to the residents and fellows.”

As the head of this team, Brian has led several important initiatives. As the Bartley-Smith/Wharton Chair, he

developed the Head & Neck Anthology of Outcomes, now known as the Bio-Clinical Anthology of Outcomes (the Anthology). The anthology is a unique and sustained integrated effort from all the head & neck radiation oncologists at the Princess Margaret. It is assisted by pathologists, radiologists, surgeons and medical oncologists and maintained in collaboration with UTDRO Assistant Professor and radiation therapist, Sophie Huang.

The anthology is the only data-collection system to have prospective point-of-care data collection with outcomes for every head & neck cancer patient treated with radiation therapy. Brian explained that the anthology has enabled several initiatives. "It allows us to link any case parameter to measurable treatment or outcome details. And it provides correlative data and outcomes for our laboratory and translational work." In addition, the anthology has assisted in Quality Assurance initiatives and in the design of clinical trials at the cooperative group level.

During his time with the Head & Neck team, Brian noticed unusual disease and changing behaviour in patients with head & neck cancers. "It was not as straightforward as we had traditionally thought," he explained. "There was some unexpected disease behaviour in HPV-related oropharyngeal cancer patients. For example, we were noticing unusual disease spread, including almost unheard of brain metastases in head and neck patients. We also noticed favorable but more delayed responses in neck disease in this patient population." Using the anthology, the team was able to cross-examine data on patients with HPV-related oropharyngeal cancer and link such risks and disease behavior in this patient population.

Brian is also known for his research on tonsillar cancer and other head & neck malignancies. In 2001, he published



a landmark paper describing how to treat patients using only one side of the neck while sparing the contralateral tissue. The unilateral neck irradiation technique described in the paper has been validated by major centres around the world, and the iconic Figure 2 from this paper continues to be used in resident training programs and notable conferences around the world.

Several organizations around the world have recognized Brian for his contributions to Radiation Medicine. He is the only Canadian to receive the Juan Del Regato Gold Medal and Lectureship. He is also the only Canadian to deliver the Annual Radiation Oncology Oration at the Radiological Society of North America's annual meeting. Earlier this year, Brian was invited to deliver the Inaugural Stiefel Lecture in Head & Neck Cancer at the MD Anderson Cancer Centre in Texas. He has also received numerous awards from the American Society of Radiation Oncology (ASTRO), Canadian

Association of Radiation Oncology (CARO), and regional organizations such as Cancer Care Ontario. Brian has also received several education awards at UTDRO, and is particularly proud to have received the Residents' Award for Excellence in Clinical Teaching. Many of his trainees, including residents, fellows, radiation therapists and nurses, have benefited from Brian's holistic approach that considers the patient as a whole.

Despite the international recognition and accolades, Brian maintains that he is a clinician first. "It is very important to remember that we are here for our patients. I want to be remembered as a doctor in the clinic before anything else." And that is how Brian's patients will remember him. There is no better proof of his dedication to his patients than the fact that many of them have become involved in fundraising initiatives to support Brian's research and cancer programs.

MATTHEW FOOTE

ALUMNUS BEHIND AUSTRALIAN GAMMA KNIFE CENTRE

Within the UTDRO community, one often hears of how the research efforts of faculty members are having a positive impact in low and middle income countries. But it is rare that UTDRO is recognized for influencing new treatment modalities in high income countries like Australia.

Dr. Matthew Foote is a Radiation Oncologist at the Princess Alexandra Hospital in Queensland, Australia and was a clinical and research fellow at UTDRO from 2009 to 2010. He is credited with launching the first publicly-funded Gamma Knife program in Australia. "UTDRO had a role to play in launching this program," he noted. "A supporting letter from UTDRO Professor Normand Laperriere describing the benefits of Gamma Knife was instrumental in my application for support."

During his fellowship at UTDRO, Matthew focused on CNS, paediatrics and stereotactic radiotherapy for brain and spine tumours. This is when he was first exposed to Gamma Knife and stereotactic body radiotherapy. "This exposure shaped my thinking about the possibilities of radiosurgery and how underutilized it was in Australia," he said. Knowing that Gamma Knife and stereotactic radiotherapy were in infancy in Australia, Matthew continued on the academic path to bring these treatments to Australia.

At the Princess Alexandra Hospital, Matthew is also the Director of the Gamma Knife Centre of Queensland and focuses on neuro-oncology, head and neck cancers, melanoma and stereotactic body and brain radiotherapy. In his first year as a radiation oncologist, he had already secured funding to establish a Linac-based intracranial radiosurgery program and a stereotactic spine program at the hospital. The following year, he established one of Australia's only comprehensive stereotactic body and brain programs.

Until this point, Matthew had been successful in increasing treatment options for people in Queensland, but this was not enough. "I wanted to provide a same-day intracranial radiosurgery service for people throughout the state of Queensland," he said. After six months of lobbying government and hospital funders, Matthew successfully secured support and over \$4 million capital investment to establish Australia's first state-wide publicly funded Gamma Knife service.



25 YEARS OF POSSIBILITIES

Above: Matthew Foote

As the Director of the newly established Gamma Knife Centre of Queensland, Matthew oversaw the procurement of the Gamma Knife equipment, the development of the Gamma Knife Suite and implementation of the clinical program. In the first year, the centre treated over 240 patients and is on track to treat 350 patients in the second year. Matthew is very pleased with this outcome. "The Gamma Knife program complements our existing and expanding stereotactic body and hypofractionated intracranial program exceptionally well."

Matthew hopes to expand the program clinically and bring in more research opportunities. "We are examining novel ways in which we can generate funds to ensure adequate funding of the research portfolio," he elaborated. "We have developed links with our scientists and the medical imaging department with a research focus on brain metastases and immune modulation. Also, with our engaged neurosurgical colleagues, we are planning to expand our vascular and functional radiosurgery caseloads."

Matthew notes that he is grateful for his time at UTDRO where he learned the skills and gained the confidence and knowledge to lead this program. "I honestly feel an immense degree of gratitude towards UTDRO for everything it has done to enable me to contribute to patients and families in Australia," he added. "For 25 years, UTDRO has been providing the foundations for leaders in Radiation Medicine throughout the world and that is worthy of celebration."

SIMAC

LEARNING ABOUT LINACS THROUGH SIMULATION



25 YEARS OF DESIGN

For over 40 years, linear accelerators, or linacs, have been used to treat cancer patients using radiation that targets cancer cells while sparing the healthy tissue surrounding the tumour. Until 2014, Medical Physicists, who are tasked with maintaining and performing quality assurance tests on linacs, had limited tools to learn about how these machines work on the inside. To enhance education about linacs, UTDRO Assistant Professor Marco Carbone and previous faculty member Miller MacPherson, along with collaborators from the University Health Network (UHN) and Trillium Health Partners have created SIMAC (simulation linac), a teaching tool that allows physicists and students to get inside the linac and learn how the different components affect the final output.

Dr. Marco Carbone, who is also a Medical Physicist at the Princess Margaret, explained that linacs are very sensitive and complicated machines. In the past when these machines were less reliable, medical physicists would often work directly with the engineers who assembled the machine to help with repairs

Above: Marco Carbone and Nicole Harnett

and troubleshooting. Recently, however, linacs have improved in reliability and the collaboration between medical physicists and linear accelerator engineers has required much less direct contact.

In addition, students training in medical physics have very few learning resources related to linear accelerator operation at the engineering level. The only textbook available in this field, written by CJ Karzmark, is now 25 years old. As well, access to the linacs themselves is limited as the linacs are usually reserved for patient treatment and are too expensive to allow students to manipulate.

Since the launch of SIMAC, physicists have been able to access real-time simulations of beam formation in a linac. SIMAC essentially replicates the relationship between the beam production hardware and provides real-time feedback on beam manipulations without fear of breaking the machines.

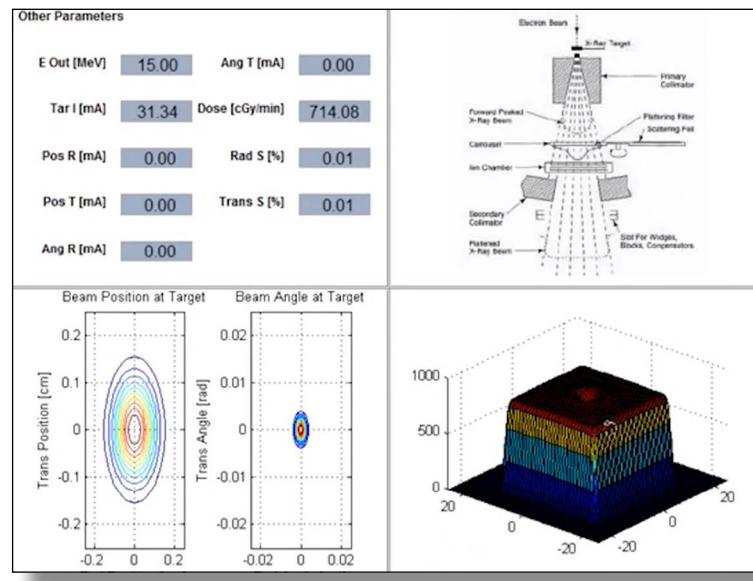
Ms. Nicole Harnett, UTDRO Assistant Professor and Radiation Therapist at the Princess Margaret, runs a course called ATec

(Accelerator Technology) through the Accelerated Education Program at the Princess Margaret. She explains the need for SIMAC. “It’s dangerous and expensive to allow students to manipulate beams in an actual linac. But with SIMAC, the learners are able to make beam adjustments and get real-time feedback on how the treatment changes.”

ATec is the only course in the world tailored to medical physicists that provides an intense and immersive environment to learn about linacs. It brings together medical physicists and accelerator service teams – two important groups of people who do not often interact in the clinical environment – to learn a common vocabulary and begin collaborating with each other. “This course provides important knowledge about the linacs to individuals who work with these machines daily,” explained Marco. “By using SIMAC, which is used in this course, the students and residents get an inside look at how the beam manipulations impact treatment.”

Although the ATec course is designed for medical physicists, it is also attended by linac service teams and employees from the Canadian Nuclear Safety Commission, Canada’s federal nuclear regulator. One of the learners who attended the ATec course recently said, “I found this course extremely useful. It really helped me understand all the topics we had discussed.”

To continue growing SIMAC, Marco and Nicole, along with their teams, received a UTDRO Collaborative Seed Grant in 2015 for a multi-institutional study. Through this grant, Marco was able to hire developers and project managers from the Techna Institute. The developers translated and optimized the MATLAB software that SIMAC ran on into a system that will run on any platform. Following this, the seed grant will be used to measure and assess the success of SIMAC.



Above: Screen shot of SIMAC interface

All training programs have learning outcomes that include assessment of participant reaction, increase in knowledge, practice change and effect on patient outcomes. Nicole explained they already have anecdotal information that SIMAC is helping physicists. “There is a lot of interest from physicists around the world who are contacting us because they want to download the software, participate and collaborate with us.” Through the UTDRO Collaborative Seed Grant, the team will also be able to assess if SIMAC is having a measurable impact on learning and knowledge and if it is having an effect on their practice.

In addition to the development and measurement of SIMAC, Nicole explained that being backed by UTDRO has been crucial to creating SIMAC. “Through UTDRO’s support, we were able to create a strong foundation that will allow us to scale SIMAC to different centres around the world.”

“It also helped to provide credibility,” Marco added. “Since UTDRO runs the largest Physics Residency program in the country, launching SIMAC here first has

provided a credibility that helped bring collaborators from other sites around the world.”

To date, physicists from several large cancer centres such as Duke University and McGill have expressed interest in collaborating with Marco and his team. By keeping the software open access, Marco is encouraging other centres to collaborate with his team and help make the software as robust and adaptable as possible.

Marco explained how SIMAC can be adapted at any cancer centre or hospital: “We are disseminating SIMAC at our larger centres like Odette and Princess Margaret Cancer Centres as well as smaller centres such as RS McLaughlin Durham Cancer Centre (Oshawa), Simcoe Muskoka Regional Cancer Program (Barrie) and Stronach Regional Cancer Centre (Newmarket). By doing this, we want to be able to show that SIMAC can be used at any centre – big or small, academic or non-academic.”

To find out more about SIMAC or to download it, visit simaclinac.com.



25 YEARS OF POTENTIAL

When Dr. Srinivas Raman was called upon to receive an award at this year's UTDRO Alumni Reception at ASTRO, he had just one thought running through his head: "I am so honored and humbled to be chosen for this award from such a talented group of individuals, whom I admire and learn from every day."

Srinivas is currently a PGY4 in the Radiation Oncology Residency program at UTDRO. Originally from Vancouver, he has been involved in research and medical education from the time he arrived in Toronto.

In Vancouver, Srinivas completed his Bachelors and Masters degrees in Mechanical Engineering from the University of British Columbia (UBC). He then switched gears and applied for medical school at UBC. It was during his medical training that he first learned of Radiation Medicine and UTDRO. "UTDRO has a very strong, international reputation for radiation oncology," he said. "I knew that there were a lot of research opportunities here and that is where I wanted to be."

Since his first year in the Radiation Oncology Residency program, Srinivas has been pursuing research in the areas of imaging and clinical trials. At the Princess Margaret Cancer Centre, he worked on a clinical trial for adapting radiation treatment based on PET imaging features with UTDRO faculty members Drs. Alexander Sun and Jean-Pierre Bissonnette.

Following this, he spent some time at the Odette Cancer Centre researching the use of quality of life instruments in palliative radiotherapy with Dr. Edward Chow, Professor at UTDRO and Radiation Oncologist at Odette. For this research, he won the 2016 Young Investigators Award at the Multinational Association of Supportive Care in Cancer (MASCC) Conference in Adelaide, Australia.

Srinivas was also recognized for his research at the 2016 UTDRO Alumni Reception at ASTRO where he received the Bernard J. Cummings Award for Research Excellence. This award recognizes trainees who have demonstrated excellence in research

Above: Srinivas Raman

SRINIVAS RAMAN

RADIATION ONCOLOGY RESIDENT EXCELLING IN RESEARCH

with the potential for strong impact in Radiation Medicine.

Dr. Edward Chow has been supervising Srinivas's research at Odette. "Srinivas is a brilliant researcher," Edward told UTDRO. "He truly deserves these awards because he has accomplished a lot during his first three years of residency, both in terms of research quantity and impact of his work. He is extremely hard working, intelligent and passionate about the clinical and research aspects of radiation oncology. He has a very bright future in our field."

Srinivas is grateful for the opportunity to start his research projects in his first year. "It was been very rewarding to be able to conceptualize an idea, write up the protocol, obtain funding, see it undergo research ethics submission and start accruing patients. I am lucky to have seen the whole process during my residency."

He also feels lucky to work with patients in a clinical setting. "Every day in the clinic reinforces my passion for radiation oncology," he said. "I am so grateful for the opportunity to bond with patients and support them during their most vulnerable times." In the final two years of his residency, Srinivas plans to continue his research and apply for a research fellowship in radiation oncology.

EVANS OKWARO

MEDICAL PHYSICS RESIDENT HELPING KENYA WITH CANCER CONTROL

The one thing you need to know about Evans Okwaro is his passion to help his fellow Kenyans. After losing his brother to cancer, he has been on a long and winding path to becoming one of Kenya's few medical physicists. "By helping me become a medical physicist, you are making a direct investment in the lives of the 27,000 people who are dying of cancer in Kenya each year," he said.

Evans is enrolled in an international version of UTDRO's Medical Physics Residency Program. For the first time in history, UTDRO faculty members are training a medical physicist outside of the regular certification process governed by the Commission on Accreditation of Medical Physics Education Programs (CAMPEP), which is the North American body that certifies medical physics residents. Evans will undergo the same training as the other residents and upon finishing the program, return to work in Kenya.

The Medical Physics team at the Princess Margaret Cancer Centre has been exploring ways to help cancer centres in other countries become self-sufficient. Similar to how they helped centres in Kuwait, the team is looking at Kenya. Dr. Monique van Prooijen, a medical physicist at the Princess Margaret, visited Kenya and met with the Radiation Medicine team in Eldoret. "I first met Evans there," she said. "He already had an interest in medical physics and needed assistance in joining a Canadian residency program."

Due to the lack of treatment facilities in Kenya, no medical physics training programs were available to Evans. After high school, he enrolled in electrical engineering and nuclear physics programs with the hopes that the right door will open up for him.

And the right door did open up. During his Master's program at the University of Birmingham, following Monique's advice, Evans researched the fetal dose of radiation using different delivery platforms. This exposure to medical physics was the reason he was chosen by UTDRO and the Princess Margaret for a modified residency in medical physics.

The Moi Teaching and Referral Hospital in Eldoret, Kenya, is currently only set up for chemotherapy and surgical oncology. They are hoping to set up a radiation therapy department in 2017. Unfortunately, there is a severe shortage of staff who can work in radiation therapy in Kenya. In the entire country, there are only a handful of radiation oncologists, radiation therapists and medical physicists. Instead of recruiting internationally for the new radiation



25 YEARS OF OPPORTUNITY

Above: Evans Okwaro

therapy department, the Moi Teaching and Referral Hospital is choosing to train its current staff, including Evans.

Since arriving in Toronto in January of 2016, Evans has been on an intensive two-year track to become a clinical medical physicist. He is working on his medical physics residency as well as taking background courses in radiobiology, anatomy, radiation shielding and protection, radiotherapy physics and imaging. "Learning many years of materials in just two years has been my biggest challenge here," he said. "I am doing two things at one time: building the foundation that my colleagues already have and learning medical physics. Since I arrived in Toronto, I have not slept more than six hours a night. I spend all my free time catching up on the background courses."

Both the current and previous Directors of the Medical Physics Residency program, Drs. Andrea McNiven and Jean-Pierre Bissonnette are excited to have Evans training in their program. Andrea explained that Evans is "very dedicated and inquisitive. He seems to have a deep sense of responsibility to ensure that he is ready to work safely and effectively when he returns to Kenya."

Evans plans to return to the Moi Teaching and Referral Hospital in Kenya to help start their radiotherapy department. "I want to strengthen the collaboration between UTDRO and the Moi University and contribute to a new Master's degree program that will be starting in Kenya," he said. "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. Dr. Jean-Pierre Bissonnette even gave me some books to start off my residency! I would love for other Kenyans to learn from such a helpful team."



25 YEARS OF VISION

Above (L to R): MHScmrs students
Winter Spence, Joanna McCusker, Natasha McMaster

BUILD IT AND THEY WILL COME UTDRO'S LEADERSHIP ROLE IN THE PROFESSIONALIZATION OF RADIATION THERAPY

If the radiation therapy profession in Canada were a building, UTDRO would be the architect – contributing structure and foundation to the evolving national radiation therapy landscape. Like an architect, UTDRO appreciated the potential of the radiation therapist (RTT) as a member of the radiation medicine team. Construction, using the blueprint prepared 25 years ago, continues today by students, faculty members and alumni of UTDRO.

Radiation therapy was first recognized as a profession in Canada by the CAMRT in 1943. It was not until the 1990s, with rapid innovations in technology and practice, that RTTs began to recognize the need to strengthen and take ownership of their identity as a profession. Instead of passively adopting the discoveries of their radiation oncology and medical physics colleagues, they needed to own and create their own body of knowledge through enquiry and innovation.

At the same time, members of the newly-established UTDRO also appreciated this desire and opportunity. UTDRO's Inaugural Chair, Dr. Bernard Cummings, and faculty member Dr. Pamela Catton understood that interprofessional care was surfacing as the best foundation for patient care and that RTTs represented a large untapped resource in this regard.

The initial foundation laid in those early days has grown in many directions since; undergraduate and graduate programs in Medical Radiation Sciences (MRS) were launched, new models of care were being explored to integrate new skill sets and capitalize on the interprofessional culture, and UTDRO graduates and faculty were assuming leadership roles nationally and internationally. All these initiatives are perpetuating a global phenomenon for new ways of working in radiation medicine.

A NEW DESIGN: ACADEMIC PREPARATION

At a time when the national professional association was backtracking from an attempt to set a higher (undergraduate) standard for entry-to-practice, UTDRO recognized that university-based preparation for RTTs was essential to its original vision. Nicole Harnett, Assistant Professor at UTDRO, joined the Michener Institute to co-build a novel undergraduate MRS Program with UTDRO — aiming to graduate RTTs and radiological and nuclear medicine technologists who were better equipped for the changing practice environment. To add stability to its message that this professional group was a valuable part of the team, and to empower RTTs to lead change, UTDRO added an additional framework to its initial blueprint – an academic model that facilitated appointment of RTTs to faculty positions.

Nicole became the first RTT in Canada to have a university-based academic appointment. The ability to appoint RTTs to faculty positions was the dawn of a new direction for the radiation therapy profession in Canada. Since joining the UTDRO faculty, Nicole has been a consistent figure in realizing UTDRO's progressive vision for RTTs, having dedicated her career to establishing an academic model and career path to benefit the system and the patients. "It has been really amazing to witness the evolution of our profession," she said. "I am privileged to work alongside the visionaries at UTDRO who had the foresight and the drive to empower radiation therapists and integrate them into an academic framework." Her work has been recognized with a Life Member award from the Canadian Association of Medical Radiation Technologists earlier this year.

WITH THE MHSCMRS, WE WERE EMPOWERING RADIATION THERAPISTS TO LEAD THEMSELVES. AND WE WERE LAYING DOWN THE FOUNDATION TO PREPARE THESE THERAPISTS TO TAKE THE PROFESSION FORWARD WITH THEM.

NEW MATERIALS: ESTABLISHMENT OF NOVEL RTT ROLES

As this structure of professionalization began to take shape, MRS graduates entered the workforce with stronger critical thinking skills and eagerness for enquiry, better equipped to contribute to innovation and to inform practice. These new undergraduate-prepared RTTs (the first class graduated in 2002) immediately infused their practice environments with more evidence-based clinical care. They began exploring novel opportunities in research and practice, supported by the emerging UTDRO interprofessional practice theme.

As we entered the 21st century, the healthcare system recognized that this new breed of RTT professionals could be mobilized in new ways to address the gaps that were emerging in radiation therapy. Cancer Care Ontario submitted a request to the provincial government to fund the exploration of a new model of care that would use advanced practice RTTs as its core. Over the subsequent 12 years, with a total of over \$4 million in funding, the Clinical Specialist Radiation Therapist (CSRT) Project has worked to harness the new knowledge, skills, and judgement within the RTT profession.

The evidence gathered by the CSRT Project served as a platform for further change at UTDRO. The leadership at UTDRO recognized that advanced academic preparation would be instrumental for the new CSRT role. In 2009, with the launch of the MHScMRS program, UTDRO added credibility to the CSRT role.

This new program, once again led by Nicole Harnett and Pamela Catton, further enriched the academic foundation laid earlier in the decade. This was the first professional graduate program for RTTs in Canada, and remains one of the only ones in the world to prioritize an immersive clinical curriculum. "This program was ahead of its time," explained Nicole. "With the MHScMRS, we were empowering radiation therapists to lead themselves. And we were laying down the foundation to prepare these therapists to take the profession forward with them."

Since UTDRO was already training RTTs, it was a natural fit for UTDRO to host the graduate program that would equip RTTs with the academic literacy necessary for them to push the boundaries of their profession. Graduates from this program have continued to expand the foundation by



Above: Nicole Harnett

creating novel positions for themselves and paving the way for future RTTs.

Kitty Chan (MHScMRS Class of 2011) now works as a CSRT in brachytherapy at the Princess Margaret Cancer Centre. “I am grateful that this program has allowed me to acquire critical thinking skills in research and to practice evidence-based medicine. The internship also allowed me to acquire advanced clinical skills in patient assessment. Having these two skills opened opportunities for my career. I am so proud to be a graduate of the MHScMRS program, and one of the pioneers in exploring this non-traditional role as a CSRT.”

PROVEN INNOVATION: INFLUENCING THE SYSTEM

UTDRO’s reach has extended well beyond what it has constructed locally. Its graduates and faculty are now influencing the broader professional movement. Since the initial academic appointment in 1999, over 40 RTTs have earned appointments. Recognizing the value of the framework created by UTDRO, Dalhousie University also recently appointed its first RTT faculty.

As part of UTDRO faculty, RTTs have helped guide UTDRO’s vision and programming; faculty members have shaped UTDRO’s RTi3 conference into an internationally-respected scientific conference for their profession. Members of the UTDRO community have also served leadership roles

within national and international professional organizations, conferences, and journals, achieving a further element of influence. Upon assuming leadership of the Journal of Medical Imaging and Radiation Sciences as its Editor-in-Chief, UTDRO Assistant Professor Lisa Di Prospero has worked tirelessly to increase the journal’s research standard while also encouraging RTT researchers to formalize and publish their work. Nicole now also chairs a national Advanced Practice Certification Committee, along with a number of other UTDRO faculty and alumni, contributing her learnings from the CSRT project to a new national designation for RTTs.

UTDRO RTTs continue to explore uncharted territory; Michael Velec, Tara Rosewall and alumnus Cynthia Eccles are among the handful of Canadian RTTs who have achieved doctorate degrees, uniquely positioning themselves to contribute to research and practice. As they push the envelope of radiation therapy practice, they lay the groundwork and serve as examples for future RTTs.

All successes aside, Nicole feels that there is much work to be done. “We are now creating a national standard for advanced practice to ensure that it is safe, regulated and consistent across the country.” In the future, Nicole hopes that the CSRT role is part of the national strategy to improve the way that radiation treatment is delivered and to increase access to radiation therapy in low and middle income countries.

INTEGRATING EDUCATION INTO THE HOSPITAL THE MICHENER-UHN INTEGRATION

At the beginning of this year, Canada's largest education institution for health sciences and Canada's largest hospital network teamed up to improve education and training for health professionals. The Michener Institute for Applied Health Sciences (Michener) and the University Health Network (UHN) have integrated to form a unique partnership that will train health professionals to work in a fast-changing clinical environment with expertise in the latest clinical technologies and practices.

The undergraduate Medical Radiation Sciences program (MRS) at UTDRO was launched in 1999 as a joint partnership between the University of Toronto and the Michener Institute for Applied Health Sciences (now known as the Michener Institute of Education at UHN). Over the last 17 years, this program has graduated over 1,500 health professionals to work in radiation therapy, radiological technology and nuclear medicine.

For the current cohort of MRS students, the Michener-UHN merger will have little immediate impact. Their classes will continue

to be held at the Michener Institute and the University, with clinical placements across Ontario. The biggest change will be seen in the coming years as the program seeks to leverage the integration to build a curriculum that will address the future needs of the professions. Cate Palmer, Director of the MRS Program, explains that "the integration between UHN and Michener, along with the University, gives us an ideal opportunity to reevaluate how we deliver education to the MRS students. Establishing new partnerships with clinicians across UHN, such as the Joint Department of Medical Imaging, will help us inform an evidence and practice-based curriculum."

The integration will also benefit practicing Medical Radiation Technologists/Therapists who want to learn new techniques and technologies or refresh their knowledge base. With a renewed view of the continuing education portfolio, practicing professionals will have a plethora of options and opportunities.

"Embedding a health sciences education institute within a

hospital is ground-breaking, and is first of its kind in Canada," said Fiona Cherryman, Senior Director of Academic Programs at the Michener Institute. "The MRS students will have a greater opportunity to learn from and with the health care professionals in the clinical environment."

In an online statement, the leadership team at Michener recognized that this integration will have a positive effect on patients. "By having a hospital and a health education institution working so closely, we will be much better able to prepare tomorrow's workforce," said Cliff Nordal, Chair of the UHN Board Education Committee. "It's a natural evolution for an organization that has always existed to tackle the health problems of the day. Preparing graduates who work well in fast-changing clinical environments and have mastered the latest technologies will benefit the entire province."

More information about the integration can be found on the Michener website: michener.ca.

I RECEIVED EXCELLENT CLINICAL EXPERIENCES IN TERMS OF CNS AND SPECIAL TECHNIQUES SUCH AS BRACHYTHERAPY FOR PROSTATE CANCER, RADIOSURGERY AND SPINE SBRT



25 YEARS OF RESEARCH

Above: Chia-Lin (Eric) Tseng

CHIA-LIN (ERIC) TSENG

FELLOW HEADS FROM ENGINEERING TO ONCOLOGY

When Dr. Chia-Lin (Eric) Tseng applied to medical school, he was unaware of radiation oncology as a discipline. But after learning about radiation oncology during medical school, he has focused all his efforts on becoming an outstanding radiation oncologist and researcher.

Eric completed his radiation oncology fellowship in June of 2016, and has been offered a Lecturer position at UTDRO and a staff Radiation Oncologist position at the Odette Cancer Centre.

Eric's career developed in several different directions until he realized his passion for Radiation Medicine. After completing his computer and electrical engineering degree at McGill University, Eric worked in the finance industry. But he continued to think about his brief experience with biomedical engineering during his undergrad years. After taking the Medical College Admission Test, he enrolled in medical school at McGill University.

During his clerkship, Eric focused on radiation oncology and visited cancer centres in Montreal, Toronto, Calgary and Vancouver. In 2010, Eric came to UTDRO as a PGY1 resident. During his residency, he worked on research projects at the Princess Margaret and Odette Cancer Centres. "At Odette, I worked on research projects with Dr. Arjun Sahgal," Eric said. "We focused on the spine, namely using MRI to assess spinal cord motion after spine SBRT."

Following his residency, Eric applied for a fellowship at UTDRO. He continued his research in CNS focusing on cancers of the spine and brain. "A wonderful opportunity came my way," he said. "Since a significant part of my research was in imaging, Arjun invited me to be involved in the new MR-Linac technology that Sunnybrook Health Sciences Centre is acquiring." This MR-Linac technology was co-developed by a team at the University Medical Centre in Utrecht, Netherlands.

Eric went to Utrecht during his fellowship to explore the application of this machine for CNS patients. He examined the technology from a dosimetric perspective to determine whether it would be feasible for CNS patients. Since Odette will soon be installing this unit, Eric has continued exploring its feasibility after returning to Toronto.

During his fellowship, Eric applied for a staff radiation oncology position at Odette. "This is when I was presented with another

great opportunity," he said. "My mentors advised me to add brachytherapy for genitourinary cancers (GU) to my skill-set. It was an incredibly busy fellowship because I was focusing on CNS patients with Arjun Sahgal as well as GU brachytherapy patients with Drs. Andrew Loblaw and Gerard Morton."

Eric's dedication during his fellowship has paid off - he was hired as a staff radiation oncologist in August with clinical duties in CNS and GU as part of the brachytherapy group. His research focus continues to be the MR-Linac unit as he explores its applications for CNS patients and its dosimetric impact while focusing on streamlining the process with an MR-only workflow. He is also working on establishing consensus on glioma contouring standards through international collaboration. In addition to this, Eric is focusing his research on SBRT for the spine, specifically examining Odette's experience on de novo radiation and re-irradiation.

Dr. Arjun Sahgal, supervised Eric during his residency as well as his fellowship. "Eric handled complex imaging based research as a resident and excelled as a fellow learning not only CNS, but prostate brachytherapy also," Arjun said. "He will lead us into the era of MR-based brachytherapy and external beam with his background in engineering and constant desire to ask and answer questions with the right methodology."

Looking back at his fellowship experience, Eric is grateful for the exposure and the opportunities that were offered to him. "I received excellent clinical experiences in terms of CNS and special techniques such as brachytherapy for prostate cancer, radiosurgery and spine SBRT. I also appreciate the terrific opportunity to go to the Netherlands and work with the team there."

Eric has already started collaborating with colleagues in Toronto and in the Netherlands. "At UTDRO, we take the interprofessional aspect for granted. The collaboration between radiation oncologists, medical physicists and radiation therapists is incredible." In addition, Eric is maintaining contact with his colleagues in his fellowship cohort. "We were (and still are) a very close group - we talk to each other regularly, whether to discuss our research or to offer support."

CLINICAL REPORT

DR. GREGORY CZARNOTA, ODETTE CANCER CENTRE

The clinical, research and educational activities of the Radiation Treatment Program at Odette Cancer Centre (Odette), Sunnybrook Health Sciences Centre (Sunnybrook) continued to be energetically active in 2015-2016. In the past year, Odette was very busy with high clinical volumes of over 7000 new radiation oncology consultations. The program has expanded its use of hypofractionated brain stereotactic treatments in addition to its single fraction radiosurgery program. We have also continued to expand our SBRT expertise with large clinical and research programs within each major disease site (e.g. prostate, pancreas, liver, CNS, breast, etc.). Odette also has an active oligometastases program with multiple ongoing clinical trials. Prostate brachytherapy continues to be a priority program and our gynecologic interstitial brachytherapy program continues to grow with the leadership of our new staff Dr. Eric Leung.

From a man-power point of view, there has been one staff radiation oncology position filled as Dr. Chia-Lin (Eric) Tseng was recruited to replace Dr. Phillip Davey who retired in November 2015. The new position provided by the MOH is currently being advertised. Steve Russell continues as our Manager and Head of Radiotherapy, and Dr. William Song continues as our Head of Physics.

The Program continues to foster its regional leadership role in cancer care. Radiation Oncologists continued to participate in radiation oncology clinics and multidisciplinary cancer conferences at a large number of academic and community hospitals including the North York General Hospital, MacKenzie Health, Royal Victoria Hospital, The Scarborough Hospital, Rouge Valley Hospital (Centenary Site), Humber River Regional Hospital, Toronto East General Hospital and St. Michael's Hospital.

Despite the very competitive grant funding climate, faculty members continued to be successful at capturing funding, with now over \$30 million dollars in external peer-reviewed and industry supported grants. Faculty at Sunnybrook published over 350 peer-reviewed scholarly articles in 2015, with 155 as primary or senior responsible author. These research grants and publications are detailed elsewhere in the annual report.

CLINICAL REPORT

DR. ANDREA BEZJAK, PRINCESS MARGARET CANCER CENTRE

The Princess Margaret Cancer Centre, Radiation Medicine Program (RMP) is one of the largest in the world with 36 radiation oncologists, 33 radiation physicists, 160 radiation therapists, 6 advanced practice radiation therapists, 3 nurse practitioners, 1 physician assistant and 115 administrative, technical and support staff, offering comprehensive and state-of-the-art image-guided radiotherapy to our patients. In fiscal year 2015-2016, our clinical activities included 8,287 patient consultations with the delivery of 10,616 courses of radiation therapy. There has been growth in several of our clinical programs, including increased use of the fully operational, state-of-the-art magnetic resonance guided radiation therapy (MRgRT) suite, the first of its kind in Canada. To date, the MRgRT suite at RMP has delivered over 200 gynecological high dose rate brachytherapy courses.

We are meeting the guidelines set by Cancer Care Ontario (CCO) for the percentage of treatment plans that should be subjected to peer-review, the percentage of cases within the “referral to consult”, as well as the “ready-to-treat to treatment” wait-time targets. Quality and safety continue to be a major emphasis in our program, with peer-review site-based rounds for all tumour types, and program-wide monthly rounds that focus on process issues, dissemination of findings and actionable items.

RMP continues to innovate to improve patient care. In the fall of 2015, an electronic application for documenting consent-to-treatment was launched program-wide. This paperless electronic system is associated with a substantial reduction in documentation errors and enables significantly faster consenting.

Staffing changes in the past year included the appointment of Drs. David Shultz, Jennifer Croke and Alejandro Berlin as Radiation Oncologists. Departures included Dr. Caroline Chung, who moved to continue her career at the MD Anderson Cancer Centre, and Dr. Anthony Brade, who moved to become the Division Head of the Department of Radiation Oncology at the Carlo Fidani Regional Cancer Centre, in the Credit Valley Hospital, Trillium Health Partners. Sadly, a key member of the program, Dr. Michael Sharpe, passed away in June 2016.

In the past year, RMP members received notable awards for their significant contributions to the field of radiation oncology. In addition, RMP members continue to be actively engaged in transforming the practice through leadership at the local, national and international levels. Dr. Mary Gospodarowicz became an Officer to the Order of Canada. Dr. Michael Sharpe was elected as a Fellow of the American Association of Physicists in Medicine (AAPM) and Dr. Michael Milosevic was selected as the Gordon Richards Lecturer at CARO 2105. Dr. David Jaffray was appointed as the Executive Vice-President of Technology and Innovation at UHN; Dr. Michael Milosevic continued to serve as the Chair of the Canadian Partnership for Quality Radiotherapy and Dr. Marco Carbone as the President of the Canadian Organization of Medical Physicists. Many other staff members hold Chair positions within various professional committees, as well as Principal Investigator roles in clinical trials.

Highlights of RMP publications include: the 9th Edition of the Union for International Cancer Control (UICC) Manual of Clinical Oncology led by Dr. Brian O’Sullivan, a ground-breaking study on the genetics of prostate cancer led by Dr. Robert Bristow, and a landmark study outlining the economic benefits associated with investing in radiation therapy in low and middle income countries by RMP members of the Global Taskforce on Radiotherapy, which is chaired by Dr. David Jaffray.

RMP staff continued to be involved in a broad range of research activities, spanning clinical, translational, basic science, physics, biology, education, health services research and beyond. Achievements in the past calendar year include obtaining over \$40 million in peer-reviewed funding and 145 peer-reviewed grants; 228 peer-reviewed publications; with 186 prospective research protocols open; and accruing 10.5% of new patients onto prospective clinical research studies.

UTDRO FACULTY MEMBERS

JULY 1, 2015 TO JUNE 30, 2016

PROFESSORS

Andrea Bezjak
James Brierley
Robert Bristow
Charles Catton
Edward Chow
Bernard Cummings
Laura Dawson
Anthony Fyles
Mary Gospodarowicz
Richard Hill
David Hodgson
David Jaffray
Normand Laperriere
Fei-Fei Liu
Andrew Loblaw
Michael Milosevic
Brian O'Sullivan
Michael Rauth
Jolie Ringash
John Rowlands
Gillian Thomas (Emeritus)
Richard Tsang
Alex Vitkin
Padraig Warde
Shun Wong
Rebecca Wong
Bradly Wouters

ASSOCIATE PROFESSORS

Ida Ackerman
Lisa Barbera
Jean-Pierre Bissonnette
Patrick Cheung
Gregory Czarnota
Cyril Danjoux
Charles Hayter
John Kim
Cynthia Menard
Gerard Morton
Geordi Pang
Lawrence Paszat
David Payne
Thomas Purdie
Eileen Rakovitch
Tara Rosewall
Arjun Sahgal
Michael Sharpe
William Song
Alexander Sun
Ewa Szumacher
May Tsao
Yee Ung
John Waldron
David Wiljer

ASSISTANT PROFESSORS

Hamideh Alasti
Steven Babic
Elizabeth Barnes
Andrew Bayley
Scott Bratman
Alejandro Berlin
Anthony Brade
Stephen Breen
Marco Carlone
Lee Chin
John Cho
Young-Bin Cho
James Chow
Caroline Chung
Hans Chung
William Chu
Peter Chung
Catherine Coolens
Tim Craig
Jennifer Croke
Melanie Davidson
Phillip Davey
Colleen Dickie
Lisa Di Prospero
Robert Dinniwell
Mary Doherty
Warren Foltz
Caitlin Gillan
Meredith Giuliani
Kathy Han
Nicole Harnett
Mostafa Heydarian
Lori Holden
Andrew Hope
Sophie Huang
Mohammad Islam
Irene Karam
Zahra Kassam
Brian Keller
Harald Keller
Anthony Kim
Anne Christine Koch
Marianne Koritzinsky
Renee Korol
Justin Lee
Young Lee
Daniel Letourneau
Wilfred Levin
Patricia Lindsay
Stan Liu
Eric Wing-On Leung
Kathy Mah
Lee Manchul
Claire McCann
Andrea McNiven
Barbara-Ann Millar
Douglas Moseley
Sten Myrehaug
Cathryn Palmer
Saibishkumar Elantholi
Parameswaran
John Radwan
Ananth Ravi
Alexandra Rink
Mark Ruschin
Arman Sarfehnia
David Shultz
Katharina Sixel
Hany Soliman
Teodor Stanescu
Kieng Tan
Mojgan Taremi
Danny Vesprini
Douglass Vines
Robert Weersink
Woodrow Wells
Collins Yeboah
Ivan Yeung
Beibie Zhang

LECTURERS

David Beachy
Renata Bradley
Angela Cashell
Charles Cho
Daria Comsa
Sarah D'Alimonte
Marisa Finlay
Audrey Friedman
Louis Fenkell
Robert Heaton
Jane Higgins
Glenn Jones
Juhu Kamra
Valerie Kelly
Jidong Lian
Winnie Li
Rosanna Macri
Kari Osmar
Karen Moline
Sarah Rauth
Raxa Sankreacha
Senti Senthalai
Anna Simeonov
Emily Sinclair
Jacqueline Spayne
Christiaan Stevens
Jonathan Tsao
Angela Turner
Yongjin Wang
Jason Wong
Jasper Yuen
Frederick Yoon
Grace Zeng

INSTRUCTORS

Martin Chai
Patricia Charman
Krista Dawdy
Wendy Flanagan
Carina Fuez
Florencia Jon
Natalie Lauzon
Nadiya Makhani
Marc Potvin
Joe Presutti
Aisha Sheikh

UTDRO TRAINEES

JULY 1, 2015 TO JUNE 30, 2016

FELLOWS

Motasem Al-Hanaqta
Taghreed Al-Hindi
Fatimah Alfaraj
Aisling Barry
Salem Billan
Francesca Caparrotti
Joe Chang
Melvin Chua
George Farha
Alireza Fotouhi-Ghiam
Daniel Glick
Rebecca Goody
Ahmed Hashmi
Joelle Helou
Ali Hosni
Ahmad Ibrahimi
Han Kim
Magali Lecavalier-Barsoum
Angela Lin
Nicola Lowrey
Lucas Castro Mendez
Tomas Merino
Fabio Moraes
Pablo Munoz
Louise Murray
Shrinivas Rathod
Anupam Rishi
Kathy Rock
Negin Shahid
Eve Tiong
Chia-Lin (Eric) Tseng
Reem Ujaimi

PHYSICS RESIDENTS

Michael Balderson
Steve Bartolac
Alyaa Elzibak
Dominique Fortin
Lisa Glass
Michael Jensen
Tania Karan
Anthony Lausch
Derek Liu
Shahram Mashouf
Sandra Meyers
Moti Paudel
Mohammad Rezaee
Manual Rodriguez
Cindy Tam
Ekaterina Tchistiakova

RADIATION ONCOLOGY RESIDENTS

Jenna Adleman
Yasir Alayed
Mohammed Aldehaim
Ahmad Bushehri
Jay Detsky
Neil D'Souza
Salman (Muhammad) Faruqi
Adam Gladwish
Rachel Glicksman
Ezra Hahn
Mohammad Hasan
Yaser Hasan
Jonathan Klein
Jennifer Kwan
Nafisha Lalani
Pencilla Lang
Sangjune (Laurence) Lee
Aruz Mesci
Sylvia Ng
Mark Niglas
Srinivas Raman
Hamid-Reza Raziee
Danielle Rodin
Jonathan So
Robert Thompson
Derek Tsang
Horia Vulpe
Vivian Yau

DONOR RECOGNITION

JULY 1, 2015 TO JUNE 30, 2016

CHAMPIONS

(\$25,000 or more)

Odette Cancer Centre - Radiation Oncology
Radiation Oncologists - PMH
Stronach Regional Cancer Centre-Radiation Oncology

SUPPORTERS

(\$1,000 to \$4,999)

Bernard J. Cummings
The Royal Canadian Legion - General Wingate Branch 256

PARTNERS

(\$5,000 to \$24,999)

Boehringer Ingelheim (Canada) Ltd
Bristol-Myers Squibb Pharmaceutical Group
Hoffmann-La Roche Ltd.
Fei Fei Liu
Merck Canada Ltd.
Varian Medical Systems
Elekta

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