A Vision for PROTON THERAPY in Ontario

HILTON TORONTO

November 5-6, 2018

SYMPOSIUM CO-CHAIRS

- David Jaffray (Princess Margaret Cancer Centre)
- Derek Tsang (Princess Margaret Cancer Centre/Hospital For Sick Children)

PLANNING COMMITTEE

- Glenn Bauman (London Health Sciences Centre)
- Eric Bouffet (Hospital For Sick Children)
- Lynn Chang (The Ottawa Hospital)
- Lisa Chong, Symposium Co-ordinator (Princess Margaret Cancer Centre)
- David Hodgson (Princess Margaret Cancer Centre/Pediatric Oncology Group of Ontario)
- Fei-Fei Liu (Princess Margaret Cancer Centre/University of Toronto Department of Radiation Oncology)
- Vimoj Nair (The Ottawa Hospital)
- Padraig Warde (Princess Margaret Cancer Centre/Cancer Care Ontario)

PANELISTS

- Jeffrey Greenspoon (Juravinski Cancer Centre)
- Crystal Hann (Juravinski Cancer Centre)

PHOTO CREDITS

UHN Visual Services (p. 4, 6, 10), University of Toronto Department of Radiation Oncology (p. 4, 6, 13), Hassan Family (p. 6, 7, 10), University of Pennsylvania (p. 10, 11), Heidelberg University Hospital (p. 11), Washington University (p. 11), CHUM (p. 12), Massachusetts General Hospital (p. 12), Mayo Clinic (p. 12), Alberta Health Services (p. 13).

DESIGN AND LAYOUT

Lisa Chong

WEBSITE

http://www.radonc.utoronto.ca/vision-proton-therapy-ontario

CONTENTS

WELCOME

A message from the Co-Chairs

Dear colleagues,

On behalf of the symposium organizing committee, welcome to Toronto! We are excited to present a comprehensive overview of proton therapy and its emerging role in cancer treatment for the people of Ontario. We have assembled an impressive panel of experts and leaders in the world of oncology, with a wealth of experience in proton therapy.

As proton therapy use expands worldwide, Canada remains one of few developed nations without a hospital-based proton beam facility. Patients, families and referring health care providers often ask about this advanced radiation treatment modality. Presently, Ontario physicians have been referring patients who need this medically necessary cancer treatment to out-of-country proton facilities in the United States. However, with the possibility of the first proton therapy facility being planned in Canada, awareness of proton therapy as an effective cancer treatment will continue to increase among Ontario cancer patients.

Proton therapy has key physical and dosimetric advantages over conventional photon therapy. Thus, the objectives of this symposium are to inform and educate health care leaders, radiation oncologists, paediatricians, physicists, radiation therapists and other health care team members about the rationale for adopting proton therapy, the technical aspects of proton therapy infrastructure, and obtaining access to proton therapy for Ontario patients.

Many thanks to Lisa Chong for coordinating the entire event, as well as the symposium organizing committee members (Drs. Glenn Bauman, Eric Bouffet, Lynn Chang, Fei-Fei Liu, David Hodgson, Vimoj Nair, and Padraig Warde) for helping make this event a success. We hope that you will learn from your time at the symposium and be able to use your new knowledge to improve patient care and access to proton therapy for cancer patients in Ontario.

Sincerely,

Derek Tsang MD MSc FRCPC

David Jaffray PhD ABMP

BACKGROUND & SYNOPSIS

SUMMARY

- Proton therapy is an advanced form of radiation treatment – currently not available in Ontario.
- Children and adults have travelled to the US for lifesaving cancer treatment that can reduce long-term side effects (each treatment can cost up to ~$750,000 CAD per patient).

SYMPOSIUM OBJECTIVES

a. Improve awareness about proton therapy, which can reduce side effects of cancer treatment, especially for children.
b. Educate health care providers about best practices in accessing proton therapy for Ontario patients.
c. Open the discussion as to how Ontario could deliver comprehensive cancer care close to home through the development of a provincial proton therapy centre.

WHY PROTON THERAPY?

Presently, there is no hospital-based proton therapy facility in Canada that can treat children or adults with cancer. Proton therapy differs from conventional, x-ray based photon therapy in that proton radiation therapy can be focused more precisely, reducing unnecessary dose to normal tissues while achieving tumour control.

Proton therapy is recommended as a curative treatment for children with cancer, as well as some adults with challenging-to-treat cancers. Since the dose to normal structures is reduced with proton therapy, this treatment is expected to reduce the side effects of radiation treatment, while maintaining the same cancer control as current x-ray radiation treatment. Children with cancer are more sensitive to radiation treatment, hence, the anticipated benefits of proton therapy are highest for paediatric cancer patients.

Canada is the only G8 country without a proton therapy facility. Oncologists across the province of Ontario have sent patients outside the country to proton therapy facilities in the United States to help patients gain access to this lifesaving treatment. Although this treatment is funded by the provincial Ministry of Health and Long-Term Care (MOHLTC), out-of-country travel poses logistical and continuity-of-care challenges for sick cancer patients and their families.

A VISION FOR PROTON THERAPY IN ONTARIO

The Princess Margaret Cancer Centre, in collaboration with the University of Toronto Department of Radiation Oncology, the Hospital for Sick Children, and the Pediatric Oncology Group of Ontario, are hosting a symposium on November 5-6, 2018 to educate and inform health care leaders and providers on proton therapy.

Dr. James Metz, Chair of Radiation Oncology from the University of Pennsylvania (UPenn) will be delivering two keynote presentations: *"Why Protons?"* and *"The Science of Proton Therapy",* while a patient family will be sharing their experiences on receiving proton therapy outside of Canada. Other speakers include leaders in the science of proton therapy from UPenn, Massachusetts General Hospital, Heidelberg Ion-Beam Therapy Centre, Washington University, and the Mayo Clinic.

Dr. Samir Patel, a researcher from Alberta, will be reporting on Canada-wide patterns of proton therapy utilization. Dr. David Roberge, Head of Radiation Oncology at CHUM, will discuss his plans to improve access to proton therapy in Quebec. A province-wide panel of radiation oncologists will discuss patterns of practice in Ontario. Finally, Dr. Padraig Warde, the provincial head of the Radiation Treatment Program at Cancer Care Ontario, will offer practical guidance on out-of-country referrals for Ontario children and adults with cancer.

A PROTON THERAPY PATIENT'S CANCER JOURNEY:

A letter from Annisa's family

On January 5, 2017, my 2 year old daughter Annisa was diagnosed with a brain tumour that required immediate surgery. Toronto SickKids surgeon, Dr. Cochran performed her surgery on January 6, 2017. We had all thought the worst was behind us following the surgery. However, a week later, we were notified that Annisa had an Ependymoma. We were given two options for radiation treatment – proton or photon radiation therapy. The doctors at Toronto SickKids recommended proton therapy for Annisa due to her age and the fact that it would have the least side effects. The obstacle we faced with choosing proton therapy was that it was only available in the United States.

Due to the amazing teamwork at Toronto Sick Kids, they were able to refer Annisa to St. Jude Children's Research Hospital in Memphis, Tennessee. Once we were approved, despite our anxiety in leaving our home, families and friends, and also leaving behind our family at Toronto SickKids Hospital, we traveled to Memphis Tennessee. The experience at St. Jude Children's Research Hospital was amazing. Annisa not only received proton therapy, but she was able to overcome her fear of doctors.

Dr. Merchant and his team welcomed us to St. Jude and took care of our daughter with compassion; he took the time to answer our questions and concerns regarding the treatment that Anissa would receive. Annisa's proton therapy spanned 8 weeks. As a part of the treatment, a mold of her face was taken to ensure her head was positioned for each of the 33 treatment sessions that were performed.

Since Annisa's diagnosis, surgery and subsequent treatment for her brain tumour, we are now having annual visits at St Jude's Children Research Hospital to monitor her development. The experience that our family had at both Toronto SickKids Hospital and St. Jude Children's Research Hospital was exceptional; the doctors and staff exemplified great patient care. These two Children Hospitals, the doctors along with their supporting staff will always have a special place in our hearts.

Sincerely,

Melicia Henry & Ibrahim Hassan

"The doctors at Toronto SickKids recommended proton therapy for Annisa due to her age and the fact that it would have the least side effects.

The obstacle we faced with choosing proton therapy was that it was only available in the United States."

PROGRAM AT A GLANCE

Monday November 5th, 2018

SPEAKER	TITLE	TIME	DURATION
Registration and Reception (Hors d'oeuvres)		5:30-6:15 pm	45 min
Fei-Fei Liu	**Welcome Remarks**	6:15-6:20 pm	5 min
Appetizer		6:20-6:40 pm	20 min
James Metz *University of Pennsylvania*	**Keynote Presentation:** **Why Protons?**	6:40-7:10 pm	30 min
Entrée		7:10-7:50 pm	40 min
Dessert		7:50 pm	
Padraig Warde *Cancer Care Ontario / Princess Margaret Cancer Centre*	**Introduction to the Out-of-Country Referral Program**	7:50-7:55 pm	5 min
Melicia Henry **Ibrahim Hassan**	**Proton Therapy Out-of-Country:** The patient and family experience	7:55-8:15 pm	20 min
Fei-Fei Liu	**Concluding Remarks**		

Tuesday November 6th, 2018

SPEAKER	TITLE	TIME	DURATION
Breakfast Buffet		7:30-8:00 am	30 min
David Jaffray	**Welcome Remarks**	8:00-8:05 am	5 min
Session 1 | Chair: David Jaffray			
Lei Dong *University of Pennsylvania*	**Nuances in Proton Therapy:** An introduction to modern proton therapy	8:05-8:45 am	40 min
Jürgen Debus *Heidelberg Ion-Beam Therapy Centre*	**Clinical indications, new centre commissioning and ramping up experiences**	8:45-9:25 am	40 min
Stephanie Perkins *Washington University*	**Compact Proton Therapy Centre:** Start-up and clinical experiences	9:25-10:05 am	40 min
David Roberge *CHUM*	**Proton therapy in Montreal:** A journey to repatriate patients to Canada	10:05-10:30 am	25 min
Break		10:30-10:45 am	15 min

Tuesday November 6th, 2018 (Continued)

SPEAKER	TITLE	TIME	DURATION
Session 2 | Chair: Glenn Bauman			
Chris Beltran *Mayo Clinic*	**Biological Models in Proton Planning:** An opportunity for future leadership and research in Ontario	10:45-11:30 am	45 min
Shannon Macdonald *Massachusetts General Hospital*	**Cost-effectiveness of Proton Therapy for Pediatrics and Breast Cancer**	11:30-11:55 am	25 min
Lunch Buffet		12:00-1:00 pm	1 hr
Session 3 | Chair: Eric Bouffet			
James Metz *University of Pennsylvania*	**Keynote Presentation:** **The Science of Proton Therapy**	1:00-2:00 pm	1 hr
Shannon Macdonald *Massachusetts General Hospital*	**Indications for Proton Therapy**	2:00-2:25 pm	25 min
Break		2:25-2:40 pm	15 min
Session 4 | Chairs: David Hodgson, Derek Tsang			
Samir Patel *Alberta Health Services*	**Alberta Referral Program and Canadian National Survey of Proton Therapy Practices**	2:40-3:00 pm	20 min
Glenn Bauman *London Health Sciences Centre* **Lynn Chang, Vimoj Nair** *The Ottawa Hospital* **Jeffrey Greenspoon, Crystal Hann** *Juravinski Cancer Centre* **David Hodgson, Derek Tsang** *Princess Margaret Cancer Centre*	**Interactive Discussion:** **A Province-wide Approach to Proton Therapy** Ontario's experience with proton referrals, individual institutional approaches and indications for proton therapy	3:00-3:40 pm	40 min
Padraig Warde *Cancer Care Ontario / Princess Margaret Cancer Centre*	**How to refer a patient to the US:** Guide to the Out-of-Country Program and Practical Advice	3:40-4:00 pm	20 min
David Hodgson, Derek Tsang	**Closing Remarks**		

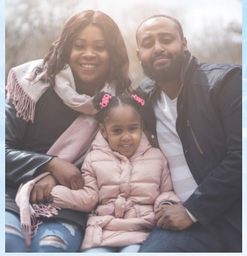
SPEAKER BIOGRAPHIES

JAMES METZ (KEYNOTE SPEAKER)

Dr. James Metz serves as the Professor and Chair of Radiation Oncology at the Perelman School of Medicine and Associate Director for Clinical Services and Programs at the Abramson Comprehensive Cancer Center of the University of Pennsylvania. He is also the Executive Director of OncoLink, the award winning Internet resource from the Abramson Comprehensive Cancer Center of the University of Pennsylvania that was founded in 1994. Dr. Metz leads OncoLink's mission to help cancer patients, families, health care professionals, and the general public find accurate cancer-related information online. He has been in his role as Executive Director since 2014 and Editor in Chief since 2000 and has overseen every major expansion of OncoLink during that time period. Dr. Metz also specializes in the use of proton and conventional radiation for the treatment of gastrointestinal malignancies. His research interests include the treatment of GI malignancies in a multidisciplinary setting, the development of novel proton delivery techniques, and the use of internet and informatics to develop personalized training for cancer patients and healthcare providers, along with predictive analytic tools. He has overseen the development and operations of the Roberts Proton Therapy Center at the University of Pennsylvania, which is the largest and most advanced proton center in the world. He has been instrumental in developing new technology for the delivery of proton therapy to cancer patients and is an international leader in the field.

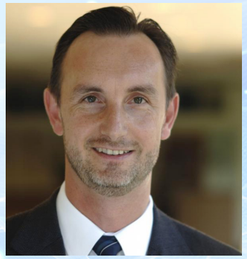
PADRAIG WARDE

Dr. Padraig Warde graduated from the University of Dublin, Trinity College, Dublin, Ireland, in 1977. He initially trained in internal medicine and medical oncology and subsequently qualified in radiation oncology. Dr. Warde joined the staff of the Department of Radiation Oncology at Princess Margaret Hospital, Toronto, Ontario, in 1987. From 1999-2012 he was Clinical Head of the Radiation Medicine Program at the Princess Margaret Cancer Centre. He is currently the Provincial Head of the Radiation Treatment Program at Cancer Care Ontario (since Jan 2009). Dr. Warde is a Professor in the Department of Radiation Oncology at the University of Toronto, and his major research interests include prostate and testicular cancer.



MELICIA HENRY & IBRAHIM HASSAN

Annisa Hassan was diagnosed with a brain tumour at the age of two in 2017. Due to her age and condition, physicians at the Hospital for Sick Children (SickKids) referred her to St. Jude Children's Research Hospital for proton therapy. Annisa's parents, Melicia Henry and Ibrahim Hassan will share their daughter's cancer journey and the family's experience with receiving proton therapy in the United States through CCO's Out-of-Country referral program.

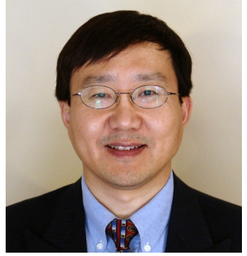


JÜRGEN DEBUS

Dr. Jürgen Debus is a medical doctor in radiation oncology and holds a PhD in physics. Dr. Debus has been a full professor at the Medical Faculty of Heidelberg University and Chairman of the department of Radiation Oncology at the Heidelberg University Hospital since 2003, and has been one of the directors of National Centre of Tumor Diseases (NCT) since 2009. Dr. Debus performed pioneering work at the Gesellschaft für Schwerionenforschung (GSI) in Darmstadt to introduce carbon ion therapy in Germany that led to the founding of the Heidelberg Ion beam Therapy center (HIT) in 2009. Since then, he became medical director and executive director of the HIT. Heidelberg is one of the leading centers for radiation therapy worldwide since it covers the entire spectrum of radio-oncologic diagnostics and therapy. More than 3500 patients per year receive state-of the art radiotherapy treatment in Heidelberg. The scientific activities of Dr. Debus are focused on the optimization of radiation therapy, including research and development of ion therapy, image guided radiotherapy and adaptive planning techniques. These technical approaches are complemented by research projects based at the NCT on the individualization of radiotherapy and multimodal cancer therapies. Dr. Debus is member of various professional societies, such as the German National Academy of Sciences, the German Cancer Society, and the scientific council for clinical and basic research of the German cancer aid. From 2015 to 2017, he was elected president of the German Society for Radiation Oncology (DEGRO).

STEPHANIE PERKINS

Dr. Stephanie Perkins is an associate professor of radiation oncology at Washington University in St. Louis. She earned her medical degree from the University of Tennessee College of Medicine. She completed her residency in radiation oncology in 2010 at the Washington University School of Medicine, where she was chief resident. Dr. Perkins was an assistant professor in the department of radiation oncology at Vanderbilt University from 2010 to 2012 before returning to Washington University. She is chief of the pediatric radiotherapy service and serves as the director of the residency training program. Her areas of clinical practice and academic interests focus on Gamma Knife radiosurgery, proton therapy and pediatric oncology with a focus on brain tumour patients and late effects therapy.



LEI DONG

Dr. Lei Dong serves as the Professor, Vice Chair and Director of Medical Physics at the Perelman Center for Advanced Medicine and the Hospital of the University of Pennsylvania. Dr. Dong earned his doctorate degree in medical physics from the University of Texas MD Anderson Cancer Center and has worked there for more than 18 years, where he was a tenured professor and deputy chair at the department of radiation physics. In 2012, he joined Scripps Health as the director and chief medical physicist for a new pencil-beam-scanning proton therapy center in San Diego, California – the first Varian ProBeam™ system in the United States. In 2017, he joined the University of Pennsylvania in Philadelphia, PA as Vice Chair and Director of the Medical Physics Division. Dr. Dong is a fellow of the American Association of Physicists in Medicine (AAPM), and is involved in many professional activities; he is a member of the therapy physics committee, the workgroup for particle beams, and the associate editor for the International Journal of Radiation Oncology, Biology, Physics, among many others. As a nationally recognized expert in radiation therapy, Dr. Dong has co-authored more than 170 peer-reviewed articles and 14 book chapters. He has conducted innovative research and clinical development in image guided radiation therapy and proton therapy. Much of his research and developmental work has been translated into clinical practice.

SPEAKER BIOGRAPHIES (continued)

DAVID ROBERGE

Dr. David Roberge is a Full Professor at the University of Montreal and an Adjunct professor at McGill University. He is a graduate of the McGill residency program and completed post-residency fellowship at Stanford and St. Jude Children's research hospital. He is currently the Head of the Department of Radiation Oncology at the CHUM and Medical Director of CDL Proton Therapy. As a scientist, his clinical research has spanned the treatment of soft tissue sarcoma, cutaneous lymphoma, cancer of the young, and brain tumours—particularly those treated with radiosurgery. He has led an FRQS-funded evaluation of the potential impact of proton treatments on pediatric and AYA patients in Quebec. He is currently involved in industry partnerships for technology evaluation and development in the field of radiation oncology. Dr. Roberge has been a local investigator for numerous clinical trials, often with exemplary accrual. Most importantly, he is the principal investigator for the CEC.3 and CE.7 randomized trials. Dr. Roberge has directed workshops, review courses and a national radiosurgery meeting. Dr. Roberge has traveled the world speaking on his areas of expertise, and has been a committee member of the IAEA and ICRU. Dr. Roberge has published over 100 scientific articles in well-recognized journals in the field of oncology—almost half as first or supervising author; he has also contributed to numerous chapters and review articles. Dr. Roberge's goal is to develop new treatment paradigms and optimal implementations of modern radiotherapy technologies in Quebec.

CHRIS BELTRAN

Dr. Chris Beltran currently holds the rank of Associate Professor of Medical Physics at the Mayo Clinic School of Medicine, and Consultant at the Department of Radiation Oncology at Mayo Clinic, Rochester, MN. He is the Vice Chair of the Division of Medical Physics, Chair of Therapeutic Medical Physics Research and head of Proton Treatment Planning. His main responsibilities include researching, introducing and integrating novel and investigational equipment/methodologies into the clinic for use in radiation therapy, supervising other medical physicists, dosimetrists, and mentoring post-doctoral fellows and graduate students. Dr. Beltran's clinical emphasis is on proton therapy for pediatric patients and his technical emphasis is on high performance computing for proton treatment planning, which includes GPU accelerated dose calculation and treatment planning, and machine learning for efficiency and safety.

SHANNON MACDONALD

Dr. Shannon MacDonald is a radiation oncologist at the Massachusetts General Hospital in Boston and an Associate Professor of Harvard Medical School. Her areas of research include pediatric malignancies with expertise in pediatric CNS tumors. Dr. MacDonald serves on leadership committees for the Children's Oncology Group and is involved with the design of several COG protocols. She has also pioneered the use of proton therapy for locally advanced breast cancer and serves as clinical Primary Investigator the multi institutional randomized trial for protons versus photons for locally advanced breast cancer (RADCOMP).

SAMIR PATEL

Dr. Samir Patel is a Radiation Oncologist with specialized training in stereotactic radiosurgery and proton beam radiotherapy, having completed his residency training at McGill University and proton therapy fellowship at the Massachusetts General Hospital. In his current role at Alberta Health Services, his focus is in the management of primary and secondary tumours of the central nervous system, genitourinary tract, and pediatric malignancies. He serves as the Provincial Chair of the Proton Therapy Referral Program at Alberta Health Services, Co-Director of the Gamma Knife Radiosurgery Program at the University of Alberta Hospital, and is a member of the ART2 LINAC MR development committee. As an Associate Professor in Oncology and Pediatrics at the University of Alberta, Dr. Patel is active in research in rare diagnoses and specialized techniques of radiation therapy. Dr. Patel serves as a Physician Member of the Out-of-Country Health Services Committee and enjoys his work as Board Member/Officer and Medical Advisor of the Make-a-Wish Foundation of Northern Alberta.

DEREK TSANG

Dr. Derek Tsang is an Assistant Professor at the University Toronto. He is appointed as a clinician-investigator in the Radiation Medicine Program, Princess Margaret Cancer Centre and an associate staff physician at the Hospital for Sick Children. He completed his medical training at Queen's University, followed by residency in radiation oncology at the University of Toronto. He obtained fellowship training in paediatric radiation oncology at St. Jude Children's Research Hospital under the supervision of Dr. Thomas Merchant, and completed a Masters' degree in clinical epidemiology at the Harvard T.H. Chan School of Public Health. He is a member of the paediatric and adult central nervous system (CNS) tumour site groups, and treats all paediatric tumours as well as adult primary CNS neoplasms.

DAVID HODGSON

Dr. David Hodgson is a Professor in the Department of Radiation Oncology, and the Medical Director of the Pediatric Oncology Group of Ontario (POGO). He holds the POGO Chair in Childhood Cancer Control at the University of Toronto, and the radiation oncology lead of the Hodgkin Lymphoma Committee of the Children's Oncology Group. His research is primarily focused on improving the treatment of pediatric and young adult patients, specifically by better understanding the long-term late effects of treatment and how they relate to optimally managing contemporary patients.

ACKNOWLEDGEMENTS

PARTICIPATING ORGANIZATIONS

UHN Princess Margaret Cancer Centre

Radiation Oncology UNIVERSITY OF TORONTO

SickKids®

POGO PEDIATRIC ONCOLOGY GROUP OF ONTARIO

GOLD SPONSOR

varian

BRONZE SPONSORS

HITACHI Inspire the Next

MEVION medical systems

RaySearch Laboratories

SUPPORTER SPONSORS

iba

PROTOM proton therapy technologies