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**On the cover:** Halifax neurosurgeons, Drs. Rollie Langille (left) and Bill Howes.
Message from the Head of Neurosurgery

DAVID B. CLARKE, MDCM, PhD, FRCSC, FACS

Welcome to Halifax Neurosurgery’s Annual Report! This Report provides an opportunity to look back on the past year, to highlight notable events and to celebrate our achievements.

When the calendar turned to 2020, we could not have imagined what lay ahead. As the Covid 19 pandemic became a reality for us in March, the routines of daily life came to an abrupt halt and everything seemed to change. We were thankful for our Atlantic Canada bubble (even if it did eventually burst) and for how our communities stepped up to protect each other. After what was for many a long year, finally, vaccines and hope are on the horizon. We missed coming together in person and we all look forward to the days when we can do so freely again.

Sadly, Dr. Rollie Langille, our retired neurosurgical colleague, passed away in March of this year. We also lost Joanne Fenerty, a proud member of the Neurosurgery Unit at the QEII for 28 years until her retirement. Dr. Langille and Joanne will be greatly missed.

There have been numerous good news stories for Neurosurgery from 2020 – I will highlight some of these.

We are delighted to welcome Dr. Stephen Lownie and his wife, Penny Campbell-Lownie. Dr. Lownie recently joined our neurosurgery service from London, Ontario, where he previously served as Head of the Clinical Neurosciences Departments and as President of the Canadian Neurosurgical Society. Dr. Lownie brings a wealth of clinical knowledge and research experience to our group, and will bolster the skull base service.

We are also very happy to have Dr. Katherine Tourigny join our Atlantic Canadian Neurosurgery Residency Program as PGY1! Katherine completed her undergraduate bachelor’s degree in Behavioural Neuroscience and Medical degree at the University of British Columbia prior to moving from coast to coast to join our team.

We have also had the pleasure to welcome, and work with, our two spine fellows: Drs. Shri Dalal and Ravi Singh. We also welcome back Dr. Carlos Restrepo as our Fellow in Functional Neurosurgery.

At the IWK, we were delighted to welcome Sarah Szego to the team as our first pediatric neurosurgery nurse practitioner. I know that the Pediatric Neurosurgery service is grateful to have Sarah’s skills added to our care team.

We officially wished a fond farewell to Fran Kelloway, 7.3 Health Services Manager, as she retired in February. Congratulations to Laura Croft who took on a new role as our 7.3 Health Services Manager. Laura has shown exceptional leadership in Neurosurgery and works very effectively with our Director, Randi Monroe. In turbulent times, we have also benefitted from Azza Mohamed’s leadership in our Neuroscience clinic.

Congratulations to Denyne Park, who became our new Neuro OR Nursing Team Lead this year. Denyne leads a young and dynamic group of dedicated Neuro nurses, all of whom have worked exceptionally hard during significant staffing shortages this past year – thank you to all!

Congratulations to Dr. David Brandman who finished neurosurgery residency and successfully completed his Royal College examinations in 2020. David completed a PhD at Brown University in neuroscience, studying brain computer interfaces. He is currently a stereotactic / functional neurosurgery fellow at Emory University in Atlanta.
Susan Rahey, our beloved Epilepsy Surgical Program Coordinator, retired this summer. Susan’s retirement, coinciding with the retirement of Dr. Sadler (epileptologist), has resulted in significant staffing changes in our Epilepsy Program. We are forever grateful for the many years of service and dedication to epilepsy patients across Atlantic Canada who have benefitted from their exemplary care.

Lynne Fenerty, a highly valued nurse and colleague who has worked tirelessly over many years in a leading role on our Neurotrauma/Injury Prevention team, has retired from her work with us. Thank you Lynne – and best wishes!

A highlight of particular significance to me personally this year was the creation of the Dr. W.J. Howes Neurosurgery Teaching Award. I want to thank Dr. Dan McNeely for his work in bringing this into reality. As many of you know, Dr. Bill Howes had a distinguished career in Halifax Neurosurgery from 1973 – 2008. This award recognizes Dr. Howes’ contributions to neurosurgical teaching and is intended to acknowledge ongoing excellence in neurosurgery teaching by a resident, fellow or attending neurosurgeon. Dr. Jacob Alant was the recipient of this inaugural award in 2020 – congratulations, Dr. Alant!

I would also like to highlight that Dr. Mark MacLean received the K.G. McKenzie Memorial Prize for Clinical Neuroscience Research – the top research prize in Canada for a neurosurgery resident – from the Canadian Neurological Sciences Federation / Canadian Neurosurgical Society. His research, supervised by Drs. Sean Christie and Gwynedd Pickett, examined potential gender biases in accessing spinal surgery. Congratulations, Mark!

I was also delighted that, based on the preclinical research we did here in collaboration with Medtronic Canada ULC, we were the first in Canada and among the first in the world to introduce the Medtronic Stealth AutoGuide™ robotic technology at the QEII Health Sciences Centre. The introduction of this and other robotic technologies will enable us to deliver safe and cost-effective care; our experience with the Stealth AutoGuide is tangible recognition that we are at the forefront of these technologies.

Finally, I am often reminded of what we have done for individual patients by the tremendous feedback that is provided – recognizing the dedication of all who take care of our patients. This is a sample (modified slightly to protect patient confidentiality) of that feedback from 2020:

I was in the Halifax Infirmary, on the 7th floor with surgery to remove a brain tumor. The doctors who looked after me and all the individuals who looked after all my MRIs and other tests were all very nice and efficient, but nothing met or beat the treatment I received from all the nurses. Considering the circumstances we are all under at present, the nurses were amazing. They took an extra few minutes when I was crying because I was frightened to try to comfort me. They took an extra 5 minutes to talk to me or listen to me or explain what medication they were giving me. They explained the surgery I was going to have which I knew nothing about until I was brought into emergency. They ensured I had a couple of showers and of course, made sure I was given clothes to get cleaned up every day. They also stood by as I was having trouble standing up. Looking back, I cannot make a single complaint and I hope you will find some way to pass my feelings along to all of them for making me feel so important to them. Please forward my extensive thank you and complete gratitude and satisfaction for the wonderful way I was treated. Thanks to all again.

And so, as I reflect on this year of change, it occurs to me that one thing that has not changed is our neurosurgical family’s unwavering commitment and dedication to our patients. In these unexpected and challenging times, we have looked after each other so that we can look after those who need us. On behalf of the Division of Neurosurgery, to all of our faculty, staff, graduates and colleagues at the QEII Health Sciences Centre, IWK Health Centre, Dalhousie University, and beyond - thank you!
Neurosurgery Faculty

DAVID B. CLARKE MD, PHD, FRCSC, FACS
- Head, Division of Neurosurgery
- Professor, Departments of Surgery, Medical Neuroscience, Medicine (Endocrinology) and Ophthalmology & Visual Sciences

Areas of Interest:
- Transsphenoidal Surgery
- Neuro-Oncology
- Epilepsy Surgery
- Neurotrauma and Injury Prevention
- Neurosurgery Simulation/Education

SEAN CHRISTIE MD, FRCSC
- Vice-Chair, Division of Neurosurgery
- Director of Research, Division of Neurosurgery
- Professor, Department of Surgery

Areas of Interest:
- Minimally Invasive Spinal Surgery
- Complex Spinal Surgery
- Neurotrauma
- Sport-Related Neurological Injuries

SEAN BARRY MD, FRCSC
- Treasurer, Division of Neurosurgery
- Assistant Professor, Department of Surgery

Areas of Interest:
- Minimally Invasive Spinal Surgery
- Complex Spinal Surgery
- Spinal Oncology
- Neurotrauma

GWYNEDD PICKETT MD, FRCSC
- Program Director, Neurosurgery Residency Program
- Associate Professor, Department of Surgery

Areas of Interest:
- Cerebrovascular Surgery
- Endovascular Treatment of Aneurysms

DANIEL MCNEELY MD, FRCSC
- Chief, Pediatric Neurosurgery, IWK Health Centre
- Associate Professor, Department of Surgery

Areas of Interest:
- Pediatric Neurosurgery
- Pediatric & Adult Epilepsy Surgery
- Spinal Dysraphism
- Hydrocephalus
- Intraventricular Neuroendoscopy
SIMON WALLING  MBCHB, FRCSC
• Assistant Professor, Department of Surgery

Areas of Interest:
• Neurotrauma
• Injury Prevention
• Neuro-Oncology

• Pediatric Neurosurgery
• Surgical Education
• Skull base Surgery

ADRIENNE WEEKS  MD, PhD, FRCSC
• Assistant Professor, Department of Surgery

Areas of Interest:
• Cerebrovascular Disease
• Endovascular Treatment of Aneurysms
• Neuro-Oncology

JACOB ALANT  MBChB, MSc, MMed, FRCSC
• Assistant Professor, Department of Surgery

Areas of Interest:
• Minimally Invasive Spinal Surgery
• Peripheral Nerve Surgery

LUTZ WEISE  MD, PhD
• Associate Professor, Department of Surgery

Areas of Interest:
• Functional Neurosurgery
• Movement Disorders
• Complex Pain
• Stereotaxy

• Image Guidance
• Neurophysiology
• Spinal Surgery

STEPHEN P. LOWNIE  MD, FRCSC, FAANS
• Professor, Department of Surgery
• Emeritus Professor, Departments of Clinical Neurological Sciences and Medical Imaging, Western University
• One Patient One Record (OPOR) Physician Lead, Urban/Academic

Areas of Interest:
• Skull Base Surgery
• Cerebrovascular Disease
Atlantic Canadian Neurosurgery Residency Program

Director: Dr. Gwynedd Pickett
Program Administrator: Heather Munroe

The primary objective of the Atlantic Canadian Neurosurgery Residency Program at Dalhousie is the development of highly-skilled neurosurgeons who can practice anywhere in the world they choose. Residents are exposed to a broad range of clinical neurosurgery cases, with graduated levels of responsibility in patient care, as training progresses. The majority of cases are carried out with significant resident involvement, and at the senior resident level, independent clinical and operative decision-making is promoted. Training in professional, communication and health advocacy skills complement their technical education.

We strive to provide an academic environment in which residents are continually challenged and receive the regular, quality feedback necessary to refine their decision-making and technical skills. National changes to the post-graduate medical/surgical training curriculum, rolled out during the past couple of years, place greater emphasis on formative feedback and individual progression through levels of competence.

The 1:1 ratio of faculty to residents at Dalhousie facilitates this, and enables mentoring in a collegial and respectful training environment. Regular teaching rounds and seminars create ample opportunities for in-depth discussion of neurosurgical cases and collaboration with colleagues in neurology, neuroradiology, and other surgical specialties.

The Atlantic Canadian Neurosurgery Residency Program is based in Halifax, Nova Scotia with rotations at the QEII Health Sciences Centre (adult) and the IWK Health Centre (pediatrics). Residents also pursue rotations at our affiliated Atlantic Canada neurosurgical sites in Saint John and Moncton, New Brunswick, and St. John’s, Newfoundland & Labrador. This provides residents with exposure to a wide variety of neurosurgical problems and training experiences.

The Division of Neurosurgery strongly believes in the role of research in residency training, and we endeavor to facilitate resident involvement in research projects that suit their interests and support their individual career goals. We are committed to developing a multi-disciplinary approach to research including clinicians and basic scientists. Residents have the opportunity to enroll in Dalhousie University’s Clinician Investigator Program (CIP), which provides structured research training that enables them to become clinician scientists upon completion of their residency.

There are currently nine neurosurgical residents in the program.

Congratulations to our Neurosurgery Graduating Resident, Dr. David Brandman. Best wishes!
Neurosurgery Residents & Fellows

**DAVID BRANDMAN**  MD, PhD  
**MD University of Calgary 2010 | Alberta, Canada**

Dr. Brandman obtained his Doctor of Medicine at the University of Calgary. Prior to studying medicine, he pursued a degree in biophysics at the University of British Columbia. Dr. Brandman pursued PhD studies and post-doctoral research at Brown University studying intracortical brain-machine interfaces. He completed his residency training with Dalhousie University in 2020. Dr. Brandman is currently completing a Fellowship in Stereotactic and Functional Surgery at the Emory University School of Medicine in Atlanta, Georgia.

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**OMAR ALSHARIF**  MBBS (PGY5)  
**MBBS King Abdulaziz University 2012 | Jeddah, Saudi Arabia**

Dr. Alsharif obtained his medical training at King Abdulaziz University. He joined the Department of Neurosurgery at King Abdulaziz University as a teaching assistant in September 2012. In 2013, he began working as a research fellow at the University of Toronto on a scholarship before entering neurosurgical residency. He is expected to complete his residency training with Dalhousie University in 2022.

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**ALWALAA ALTHAGAFI**  MBBS (PGY5)  
**MBBS King Abdulaziz University 2013 | Jeddah, Saudi Arabia**

Dr. Althagafi obtained his medical training at King Abdulaziz University. Prior to studying medicine, Dr. Althagafi pursued a Bachelor of Medical Laboratory Science at the University of Otago in New Zealand. He is expected to complete his residency training with Dalhousie University in 2022.

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**ERIKA LECK**  MD (PGY4)  
**MD Dalhousie University 2017 | Nova Scotia, Canada**

Dr. Leck obtained her Doctor of Medicine at Dalhousie University in 2017. Prior to studying medicine, Dr. Leck obtained a Bachelor of Science Degree (Honours) in Life Sciences at Queen's University. She is currently pursuing her Masters in Practical Ethics at Oxford University, and is also enrolled in the Dalhousie Clinician Investigator Program. She is expected to complete her residency training with Dalhousie University in 2024.

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**MOSAAB ALSUWAIHEL**  MBChB (PGY4)  
**MBChB National University of Ireland 2015 | Dublin, Ireland**

Dr. Alsuwaihel obtained his medical training in 2015 from the Royal College of Surgeons in Ireland. Dr. Alsuwaihel is expected to complete his residency training with Dalhousie University in 2023.

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**JAE HO HAN**  MD (PGY3)  
**MD Dalhousie University 2018 | Nova Scotia, Canada**

Dr. Han obtained his Doctor of Medicine at Dalhousie University in 2018. Prior to studying medicine, Dr. Han completed a Bachelor of Science degree (Honours) in Biochemistry & Molecular Biology and Neuroscience at Dalhousie University. He is expected to complete his residency training with Dalhousie University in 2024.
Neurosurgery Residents & Fellows (cont’d)

**MARK MACLEAN** MD, MSc (PGY3)
MD Dalhousie University 2018 | Nova Scotia, Canada
Dr. MacLean obtained his Doctor of Medicine at Dalhousie University in 2018. Prior to studying medicine, Dr. MacLean completed an MSc in Chemistry at Dalhousie University. He is expected to complete his residency training with Dalhousie University in 2024.

**JENNA SMITH-FORRESTER** MD, MSc (PGY2)
MD University of British Columbia 2019 | British Columbia, Canada
Dr. Smith-Forrester obtained her Doctor of Medicine at the University of British Columbia in 2019. Prior to studying medicine, Dr. Smith-Forrester completed a Bachelor of Science (with Distinction) in Neuroscience and Biology at Dalhousie University, followed by a Masters of Neuroscience at the University of British Columbia. She is expected to complete her residency training with Dalhousie University in 2025.

**ABDULAZIZ BOKERIS** MBChB (PGY2)
MBChB National University of Ireland 2017 | Dublin, Ireland
Dr. Bokeris obtained his medical training in 2017 from the Royal College of Surgeons in Ireland. Dr. Bokeris is expected to complete his residency training with Dalhousie University in 2025.

**KATHERINE TOURIGNY** MD (PGY1)
MD University of British Columbia 2020 | British Columbia, Canada
Dr. Tourigny obtained her Doctor of Medicine at the University of British Columbia in 2020. Prior to studying medicine, Dr. Tourigny completed a Bachelor of Science in Behavioural Neuroscience at the University of British Columbia. She is expected to complete her residency training with Dalhousie University in 2026.

**CARLOS RESTREPO RUBIO** MD (Fellow)
MD Universidad el Bosque 2006 | Bogota, Colombia
Dr. Restrepo Rubio obtained his Doctor of Medicine from Universidad el Bosque in 2006 and completed his neurosurgery residency at Universidad el Bosque in Bogota, Colombia in 2014. He completed a Peripheral Nerve Surgery Fellowship at the Mayo Clinic in Rochester, Maine in 2015 and a Deep Brain Stimulation Fellowship at the Mayo Clinic in 2016. He began a Fellowship in Functional Neurosurgery at Dalhousie in 2019.

**SHRIKANT DALAL** MBBS (Fellow)
MBBS Shri. Vasantrao Naik Government Medical College 2008 | Yavatmal, India
Diplomate of National Board (DNB) Orthopaedic 2014 - Diploma in Spine Surgery University of Alberta 2019
Dr. Dalal obtained his Bachelor of Medicine/Bachelor of Surgery from Shri Vasantrao Naik Government Medical College in 2008. He completed his Orthopaedic training in Mumbai. Most recently, he completed a Spine Fellowship in Edmonton.

**RAVINDRA SINGH** MBBS (Fellow)
MBBS Ganesh Shankar Vidhyarthi Memorial Medical College 2005 | Kanpur, India
Dr. Singh obtained his Bachelor of Medicine/Bachelor of Surgery from Ganesh Shankar Vidhyarthi Memorial Medical College, India, in 2005. He completed his Orthopaedic training in Delhi and then served as a consultant prior to completing a Fellowship in Minimally Invasive Spine Surgery in Seoul, Korea. Most recently, he completed a Fellowship in Paediatric Spine Surgery in Calgary.
Clinical Activities

Neurosurgical Procedures

- Cerebrovascular: 12%
- Other: 7%
- Spine: 9%
- Cranial Procedures: 31%
- Functional: 25%
- Pediatric: 15%

Ambulatory Care Visits

- Y2018: 6000
- Y2019: 6000
- Y2020: 5000

Neurosurgical Procedures

- Y2018: 1200
- Y2019: 1200
- Y2020: 1000
Academic Neuroscience Program and Neurosurgery Inpatient Unit 7.3

Director Academic Neuroscience Program 7.3 & 7.4: Randi Monroe
Health Services Manager 7.3 Nursing Team: Laura Croft
Health Services Manager 7.3 Interdisciplinary Team: Joanne Comeau

2020 was filled with change and challenges for the inpatient Neurosurgery unit as we endured the world-wide COVID-19 pandemic. Neurosurgery is a rewarding work area; however, the trials and tribulations of 2020 certainly added additional challenges. We had to manage ever-changing public health and occupational health guidelines to best protect our patients, families and team; as well as an immeasurable amount of stress and anxieties related to both work and our home lives. Although 2020 was a year full of obstacles and challenges, the staff of 7.3 never once wavered in their dedication and commitment to our patients and to each other. The team provided compassion to our patients and each other and demonstrated team resiliency.

We continued to provide excellent patient care, facilitated virtual gatherings for patients with their families, offered an endless amount of emotional support and stood by our patients when they were alone with a new diagnosis and injuries. The teamwork on 7.3 is like no other.

We also had several team members come forward to assist in the 1st and 2nd wave of the pandemic by volunteering for many COVID-19 areas such as Primary Assessment Clinics, Public Health, Secondary Assessment Clinics and Northwood.

We said goodbye to some staff as they moved on to continue growing their career paths and we gave a very warm welcome to many new staff this year. Unfortunately, we had to say a huge goodbye to our previous manager of the nursing team, Fran Kelloway, as she retired in February. We wish her well in her retirement.

The main goal this year was to continue building capacity in our team. With the support of the leadership team, as well as motivated and dedicated senior staff on the unit, we were able to continuously and diligently work towards this goal. The staff have grown daily and settled into our new staffing complement and routines. The mix of Registered Nurses and Care Team Assistants is allowing us to provide thorough patient care while also allowing time to work on care planning, assessments, and education.

Leadership positions on 7.3:
• Charge Nurse: Emily-Rose Tarasco-McGrath finished her term as charge in October and Krissy Dillon took over. Renee Boudreau continued as Krissy’s co-charge.
• Resource Nurse: Jaime Brewer finished her role in the resource position and Dayna El-Hassan continued as resource nurse.
• Neurosciences Clinical Nurse Educator: Melissa Brinson
• Brain Tumor Nurse: Samantha Warren went on maternity leave and Megan Lambert filled this position.

The inter-disciplinary team on 7.3 remains quite stable. A new schedule is being trialed in recreation therapy which allows for more consistent staffing. Physiotherapy continues with prioritized Saturday services which is going well. We are also trialing different models with our assistants to optimize care delivery. Some equipment was purchased for occupational therapy to advance care, while Barb Sowinski continues to address social work needs as they arise. The team works very collaboratively with its 7.4 Neurology colleagues to ensure coverage and high-priority needs are addressed. This approach has definitely enhanced patient care on 7.3.
Clinical / Research Staff

LORELEI AUDAS
RN, BScN, CCRP
Program Coordinator: Neurotrauma/Simulation

RYAN GREENE
MSc
Research Coordinator: Neurosurgery Spine

NICKY AYLES
RN
Neurosurgery Clinic

ANDREA L.O. HEBB
MSc., PhD, RN
Clinical/Research Coordinator: Brain Tumour Maritime Lateral Skull Base Neuropituitary

MISSY BRINSON
RN
Clinical Nurse Educator

RON HILL
Technology Coordinator

CORALEA CAREY
Research Assistant: Neurotrauma/Injury Prevention

MURRAY HONG
PhD
Neurosurgery OR/Technical Specialist

PEGGY FLYNN
RN
Neuromodulation

JUDITH JARRETT
RN, CCRP
Program Coordinator: Cerebrovascular
Clinical / Research Staff (cont’d)

LISA JULIEN  
RB, BScN, CCRP  
Research Manager/Coordinator: Neurosurgery Spine

CAROLE-ANN MILLER  
RN, NP  
Cerebrovascular

NELOFAR KURESHEI  
MD, MHI  
Research Associate: Neurotrauma/Simulation/ Neurosurgery Spine

SHIRLEY MACLEOD  
Research Assistant: Neurosurgery Spine

MEGAN LAMBERT  
RN  
Brain Tumour Liaison Nurse

JAMIE MASON  
RN  
Neurosurgery Clinic

ANGELA MEAGHER  
RN, NP  
Neurosurgery Spine

SARANYAN PILLAI  
PhD  
Research Associate: Neurosurgery Spine
Administrative Staff

DEBBIE AMIRAULT
Assistant to Dr. Sean Barry

MELISSA COOK
Assistant to Dr. Sean Christie

KATHARINE ANDERSON
Assistant to Dr. Gwynedd Pickett

EMMA GILLESPIE-FRASER
Assistant to Dr. Adrienne Weeks

LORRAINE BELL-HILL
Administrator Division of Neurosurgery

DIANE JARDINE
Assistant to Dr. David Clarke

CATHY CARON
Assistant to Dr. Daniel McNeely

MAUREEN KAY
Assistant to Dr. Jacob Alant Neurosurgery Spine Referral Coordinator
KELLY MARTIN
Executive Assistant to Dr. David Clarke

CHRIS SY SHAY
Assistant to Dr. Simon Walling

HEATHER MUNROE
Residency Program Administrator

PAM SLAUENWHITE
Assistant to Dr. Lutz Weise

ELIZABETH SCOTT
Assistant to Dr. Stephen Lownie

OR Nurses

TEAM LEAD: DENYNE PARK
IVY ADRIANO
MEGHAN ANDERSON
SAMANTHA CAMERON
KANDIS CHURCH
JACKIE ESPERA
AMANDA GEORGE
ANNE JURCINA
ALLISON PURCELL
LINDEN SERROUL
BRITTANY SULLIVAN
JESSICA TAYLOR
Neurosurgery Spine Program

Director: Dr. Sean Christie
Program Manager/Coordinator: Lisa Julien

The Neurosurgery Spine Program provides comprehensive care to patients with spinal disorders and spinal cord injuries.

Events and Accomplishments
- This year the Spine Program welcomed our two Spine Fellows, Dr. Shrikant Dalal and Dr. Ravi Singh. Dr. Dalal completed his orthopedic training in Mumbai and then spent time in the UK. Most recently he completed a spine fellowship in Edmonton. Dr. Singh completed his orthopedic training in Delhi, India and then served as a consultant prior to completing a Fellowship in minimally invasive spine surgery in Seoul, Korea. Most recently he completed a Fellowship in pediatric spine surgery in Calgary.
- Congratulations to Dr. Mark MacLean for winning the KG McKenzie Memorial Award for his research on “Are There Differences between Men and Women in regards to Pre-Operative Expectations and their Post-Surgical Satisfaction? A Retrospective Analysis”.
- We participated in the Spinal Cord Injury Network of the Atlantic Provinces (SCINAPS) 2020 Stakeholder Retreat held at the Lord Nelson, September 25-26, 2020. This was a mixture of presentations and planning sessions, with a focus on Emotional Health and Wellbeing post-SCI across the continuum, overview of research being conducted and discussion on future projects.

Research Projects
We have had an active research year in the Spine Program, participating in investigator-initiated and pharmaceutical-driven studies, as well as multi-center national and international studies. Below is the list of projects we are conducting.

- M16-077: Collaborating with AbbVie Incorporated, we began screening for traumatic spinal cord injured patients to participate in a 52 week, phase 2a, randomized, double-blind, placebo-controlled, multi-centered, and proof of concept study, to assess the safety and efficacy of Elezumumab. Treatment of spinal cord injury (SCI) patients with elezumumab has the potential to enhance recovery by promoting neuro-restoration that, in addition to standard of care, may make a significant positive impact on patients’ overall quality of life. Elezumumab is a monoclonal antibody of the human immunoglobulin (Ig) G1 isotype that binds specifically to repulsive guidance molecule A (RGMa).
• **PROTEST:** Collaborating with the Intensive Care Unit (ICU), we are participating in the following study, “Prophylaxis for Venous Thromboembolism in Severe Traumatic Brain Injury, a double-blind Randomized Controlled Trial”.

• **RHSCIR:** This year marks our 13th year of enrollment in the Rick Hansen Spinal Cord Injury Registry (RHSCIR), a national registry of patients with traumatic spinal cord injury (tSCI). In April 2020 we started collecting data on Non-traumatic SCI patients who are admitted to the Nova Scotia Rehabilitation Center. To date, 291 patients have been included in this registry (279 tSCI, 12 non-tSCI).

• **CSORN:** The Canadian Spine Society (CSS) Registry is a national health data registry that tracks outcome measures of the surgical and non-surgical treatment of specific spinal conditions. We are currently in our 6th year of enrollment for this registry. The spine patient populations who are offered participation at our site are surgically managed for the following procedures/indications:
  - Cervical Arthroplasty
  - Cervical Myelopathy/Myeloradiculopathy
  - Lumbar Spondylolisthesis.
Currently 236 patients have been included. Within this registry, patients may also be eligible for three sub-studies:
1. Management and Outcome of Cervical Spondylotic Myelopathy – A Standardized Clinical Assessment and Management Plan;
2. Surgical Treatment of Degenerative Spondylolisthesis: A Standardized clinical assessment and management plan (SCAMPS) Canadian Spine Society (CSS) multi-center prospective cohort study; and
3. Decompression Alone vs. Decompression and Instrumented Fusion for the Management of Lumbar Spinal Stenosis Associated with Stable Degenerative Spondylolisthesis: A Pragmatic Randomized Clinical Pilot Trial.

• **TITANIUM:** A Study of Titanium Ion Concentrations in the Whole Blood of Patients Following Metal-on-Metal Cervical Arthroplasty. This project is designed to investigate the level of titanium metal ions in a patient’s whole blood. Patients who are invited to participate have previously undergone, or are scheduled to undergo cervical arthroplasty surgery using the Medtronic Prestige LP prosthesis or are scheduled to undergo a single level anterior cervical discectomy and fusion with the Atlantis Vision Elite plate. Patients will be monitored for 10 years post-op; all serum samples are sent to a central facility for analysis. If patient titanium levels are reported to be > 100 ppb there may be health concerns. To date 27 out of 40 subjects have been enrolled.

• **CSORN IMPLANTS:** “Long-term Patient Reported Outcome Measures of Spine Surgery Instrumentation Systems in Canada: A Canadian Spine Outcomes and Research Network Sub-Study.”

• **FRAILTY SCI:** “Frailty Index in Spinal Cord Injury Patients: The assessment of frailty may be an important determinant in the appropriate management of older SCI patients.” A series of standard laboratory values and clinical data have been previously used to determine a frailty index, which has been linked to clinical outcomes in the elderly. This project will investigate whether the frailty index is associated with inhospital mortality in SCI patients. Analysis is complete and publication is pending.

• **FRAILTY IN SPINE PATIENTS:** In collaboration with the Canadian Spine Outcomes and Research Network, we hope to develop a frailty index in spine surgery patients using routinely collected health record data. The questions we are asking are:
  1. What is the association between frailty and adverse outcomes following spine surgery?
  2. Is preoperative frailty associated with functional outcomes following spinal surgery?
  3. Does spinal surgery result in lower frailty levels?

• **FITBIT:** “Can We Better Predict Long-Term Success Of Permanent Spinal Cord Stimulators?” We were successful in receiving a grant from the NSHARF and currently have three patients enrolled out of 25.

• **MODIC:** “Occult Bacterial Discitis and Modic Change in Patients receiving Surgical Therapy for Lumbar Disc Herniation.” We were successful in receiving a grant from NSHARF and currently have 19 patients enrolled out of 78.

• **MELATONIN:** “Plasma Melatonin Levels After Acute Traumatic Spinal Cord Injury in Individuals with Complete and Incomplete Cervical and Thoracic Spinal Cord Injury.” We were successful in receiving a grant from NSHARF and a QEII Foundation donation. Currently we have 4 patients enrolled.

• **MRIs:** There is significant overuse of lumbar spine MRI scans in Canadian practice, with over half of MRI requests being inappropriate or uncertain if the scan was needed. We are conducting a retrospective study to assess the appropriateness of ordering lumbar spine MRIs in Nova Scotia. We are collaborating with the Department of Diagnostic Imaging and have reviewed 2025 patient MRIs.

• **GENDER DIFFERENCES:** “Are There Differences between Men and Women in regards to Pre-Operative Expectations and their Post-Surgical Satisfaction? A Retrospective Analysis of the Canadian Spine Outcomes Research Network” The CSORN database was retrospectively analyzed for all patients over the age of 18 and had lumbar degenerative disease. Outcome variables included reasons for pursuing surgical intervention, expectations of pain post-surgery, expected lifestyle changes after surgery, post-surgery satisfaction, and improvement in well-being and reduction in pain.
Neurosurgery Spine Program (cont’d)

- **A DATA-DRIVEN E-HEALTH PLATFORM** for Informed and evidence-based decision making to triage spinal surgeries. In collaboration with Dr. Raza Abidi (Faculty of Computer Science, Dalhousie University), we have been awarded funding from a CIHR Personalized Health Catalyst Grant to conduct this project.

- **NECK PAIN:** “Epidemiology and Outcomes of Neck Pain after Surgery for Cervical Radiculopathy” We conducted a multi-center, ambispective review of consecutive patients who underwent surgery for cervical radiculopathy that were enrolled by The Canadian Spine Outcomes Research Network (CSORN). The study highlights a significant improvement in 12-month post-operative PROMs, including NP, across various commonly employed surgical procedures for the treatment of cervical radiculopathy. These studies offer insight into the utility of these procedures for the reduction of axial neck pain and may allow clinicians to more accurately prognosticate patients’ convalescence and aid in surgical decision-making. Publication is pending.

**Publications**


Presentations
The following abstracts were presented at Canadian Spine Society, 20th Annual Scientific Conference Fairmont Château Whistler, BC, Feb. 26–29, 2020 (published in Canadian Journal of Surgery)

1. Do patients with recurrent lumbar disc herniations fair worse with discectomy than primary operations? A retrospective analysis from the Canadian Spine Outcomes and Research Network. Sean Christie, Ryan Greene, Andrew Glennie.

2. A province-wide assessment of the appropriateness of lumbar spine MRI. Ryan Greene, Dakota Duquette, Dylan LeBlanc, Brian Martell, Matthias Schmidt, Sean Christie.


9. Traumatic spinal cord injuries among Aboriginal and non-Aboriginal populations in Canada: an ambispective outcomes study. Uzair Ahmed, Suzanne Humphreys, Dilnur Kurban, Carly Rivers, Melanie Jeffrey, Sandra Juutilainen, Steve Casha, Sean Christie, Teren Clarke, Brian Drew, Karen Ethans, Michael Fehlings, Richard Fox, Gary Linassi, Travis Marion, Colleen O’Connell, Jérôme Paquet, Janine Reid, Lauren Scott, Daryl Fourney, the RHSCIR Network.


11. Sex differences in the surgical management of lumbar degenerative disease: a systematic review. Mark MacLean, Charles Touchette, Jae Ho Han, Sean Christie, Gwynedd Pickett.

Neurosurgery Spine Program (cont’d)

Funding

Medtronic of Canada, Ltd. Unrestricted Research Grant: $40,000 (2020)


NSHA Research Fund Grant (Fitbit study): $25,000 (2018-2020)

NSHA Research Fund Grant (Melatonin Study): $25,000 (2019-2021)

QEII Foundation (Donor) (Melatonin Study): $50,000 (2019-2021)

NSHA Research Fund Grant (Modic LDH): $25,000 (2019-2021)

CIHR PROTEST Trial: $742,000 (2018-2023)

University Health Network (RTC-DA vs. DF study): $10,000 (2017-2020)

CSORN IMPLANT study: $8,281 (2020)

Abbvie (M16-077): $367,632 (2020-2023)

Team Members
• Dr. Sean Christie, Neurosurgeon
• Dr. Jacob Alant, Neurosurgeon
• Dr. Sean Barry, Neurosurgeon
• Dr. Lutz Weise, Neurosurgeon
• Dr. Saranyan Pillai, Research Associate
• Lisa Julien, Research Manager/Coordinator
• Ryan Greene, Research Coordinator
• Shirley Macleod, Research Assistant
• Murray Hong, Neurosurgery OR/Technical Specialist
• Debbie Amirault, Administrative Assistant
• Melissa Cook, Administrative Assistant
• Pam Doucette, Administrative Assistant
• Maureen Kay, Administrative Assistant

Team Collaborators
• Dr. Cynthia Dunning Zwicker, Research Manager, Orthopedic Spine Service
• Dr. Andrew Glennie, Orthopedic Surgery
• Dr. Scott Kehler, Geriatric Medicine
• Dr. Jason Leblanc, Microbiology
• Dr. Sonja McVeigh, NS Rehabilitation Centre
• Dr. Kate Montgomery, NS Rehabilitation Centre
• Dr. William Oxner, Orthopedic Surgery
• Dr. Glenn Patriquin, Microbiology
• Dr. Ken Rockwood, Geriatric Medicine
• Dr. Matthias Schmidt, Diagnostic Imaging
• Dr. Christine Short, NS Rehabilitation Centre
Neuromodulation Program

Director: Dr. Lutz Weise  
Program Coordinator: Christine Potvin  
Program RN: Peggy Flynn

Our neuromodulation program provides neuromodulation care to the people of Atlantic Canada (population ~2.3M). The program focuses on improvements to quality of life primarily for people suffering from movement disorders, complex pain syndromes, and spasticity. The patient population includes those with implantable neurostimulators for deep brain (DBS), cortical, spinal cord (SCS), and peripheral nerve stimulation. We currently follow 225 people with stimulators for movement disorders, and 235 with stimulators for pain.

In 2020, the program welcomed Peggy Flynn who accepted the Neuromodulation RN position in March. In collaboration with the epilepsy team, we completed our first DBS for epilepsy. We were pleased Dr. Carlos Restrepo extended his Fellowship to June 2021.

Regular Deep Brain Stimulation (DBS) clinics are scheduled with several Neurologists to provide a comprehensive assessment of potential DBS candidates. In addition, there are DBS rounds in which patients are reviewed by the team and treatment options discussed.

The DBS rounds also provide regular academic sessions presenting the current evidence and guidelines. These rounds are certified by the maintenance of certification program of the Royal College. In our complex pain clinic, patients are seen and evaluated by both a neurosurgeon and a complex pain anesthesiologist and a treatment plan is developed.

With their consent, patient information including quality of life surveys and intra-operative microelectrode recording data are entered into a database for analysis.

Various research activities are in progress, including electrophysiological and tractography studies in patients undergoing Deep Brain Stimulation. Ethics approval was obtained on “Correlation of Tractography and Motor Evoked Potentials in Deep Brain Stimulation” and we enrolled 48 patients to date. Further projects include the evaluation of the impact of disease lateralization on imaging characteristics such as tractography; device research registry in which we collect several quality of life questionnaires, as well as pertinent information relating to the device; and examining prediction of success of a spinal cord stimulator dependent on patient activity during a trial period.

Oral Presentations were given at local, national and international meetings.
Neuromodulation Program (cont’d)

Publications


Weise L. Comment on: Letter to the Editor by Harding and Illies. Canadian Journal of Neurological Sciences.

Presentations
Restrepo CE, McNeely PD, Sheriko J. Subcutaneous Intrathecal Catheter System for repetitive administration of Nusinersen in patients with Spinal Muscular Atrophy and challenging spinal deformities. Accepted for presentation in the Canadian Neurological Sciences Federation, 55th Congress. Cancelled because COVID-19.


Restrepo CE, Clarke DB, McNeely PD, Weise LM. The accuracy of 3D fluoroscopy (XT) vs computed tomography (CT) registration in frame-based stereo-electroencephalography (SEEG) surgery. American Epilepsy Society meeting. Virtual. December 2020

Workshop

Awards and Recognitions

Team Members
• Dr. Lutz Weise, Neurosurgeon
• Dr. Sean Christie, Neurosurgeon
• Dr. Carlos Restrepo, Neurosurgery Fellow
• Dr. Ian Beauprie, Anesthesiologist/Pain Specialist
• Christine Potvin, Program Coordinator
• Peggy Flynn, Program RN
• Ron Hill, Neurosurgery Technology Coordinator
• Haley Power, Neurosurgery Technology Coordinator
• Murray Hong, Neurosurgery OR/Technical Specialist
• Susan Morris, Neurophysiologist
• Intraoperative Neurophysiological monitoring
• Dr. John Fisk, Neuropsychologist
• Dr. Mark Rubens, Psychiatrist
• Dr. David King, Neurologist (movement disorders)
• Dr. Kerry Schoffer, Neurologist (movement disorders)
• Dr. Roger McKelvey, Neurologist (movement disorders)
• Dr. Heather Rigby, Neurologist (movement disorders)
• Pam Slauenwhite, Administrative Assistant

Off-Site Collaborators
• Dr. Renju Kuriakose, Neurologist, NB
• Dr. Kyna Squarey, Neurologist, NL
Halifax Surgical Epilepsy Program

Co-Chairs: Drs. David Clarke and Kristin Ikeda
Epilepsy Program Nurse: Marlee Richardson

This year our program experienced significant changes with the retirement of program leaders, Dr. R. Mark Sadler and Susan Rahey. They have spent their careers dedicated to the development of this epilepsy program, and have made it what it is today. We are grateful for their many years of commitment to outstanding care of patients across Atlantic Canada.

Epilepsy patients referred from Nova Scotia, Prince Edward Island, New Brunswick, and Newfoundland and Labrador are served by a comprehensive epilepsy program supported by the Divisions of Neurology and Neurosurgery, including:

- specialty outpatient clinics
- Neuropsychologist, Neuropsychiatrist, Psychometrist and Social Worker
- a four-bed inpatient Epilepsy Monitoring Unit (scalp and invasive recordings)
- access to a variety of structural and functional imaging techniques (including 3T MRI, fMRI, PET, SPECT and MEG)
- surgical options including depth electrode implantation (SEEG, and/or subdural electrodes), cortical resection, lesionectomy, corpus callosotomy, DBS, and vagus nerve stimulator implantation
- Mike Whitehead stepped up to the role of Team Lead for the EEG and EMG departments.
- New patient information pamphlet on “First Unprovoked Seizure” has been distributed to Emergency departments around the province.
- New “Approach to Seizure in the Emergency Department” algorithm is in development and will be distributed province-wide once completed.
- Pre-printed Admission Standing Orders for EMU admissions (for both SEEG and routine admissions) have been developed.
- Development of new EEG requisition and EMU referral forms.
- New EMU patient information pamphlet under development.
- Marlee has initiated independent nurse-led VNS patient clinic for device interrogation and setting adjustments.
- There were 39 admissions to the Epilepsy Monitoring Unit (EMU). Due to the COVID 19 pandemic, the EMU was closed from mid-March until July of 2020.
- Number of referrals to the epilepsy program continue to increase for both the first seizure and general epilepsy clinics – 677 referrals processed (compared to 644 in 2019, 554 in 2018, 477 in 2017).
- Weekly epilepsy case conferences have transitioned to a virtual platform this year. This has allowed for continued participation of health care providers from the IWK Health Centre, Maritime Medical Genetics and the MEG laboratory, as well as some of our international colleagues.
- Celebration of Purple Day for Epilepsy Awareness on March 26th was held virtually this year. Despite not being able to celebrate in person, it was success!
- Neurology is working closely with Neurosurgery to develop a deep brain stimulation (DBS) program for epilepsy patients. In the summer of 2020, our first epilepsy patient received DBS for epilepsy, and is doing well.
- We continue to benefit from the enthusiasm and commitment brought to the program by Fellows and Residents assigned to the Epilepsy Program.

Program Goal
To provide access to comprehensive investigations, optimal medical management and innovative surgical treatments in the setting of a comprehensive epilepsy program; for people in Nova Scotia, and throughout Atlantic Canada.

Accomplishments
2020 saw a continuation of the service increases resulting from the expansion of the Epilepsy Monitoring Unit. Service was further enhanced by our Neurosurgery Fellow, Dr. Carlos Restrepo, who contributed significantly to the Surgical Epilepsy Program.

- Dr. Ben Whatley has joined the epilepsy program after completing a two year Fellowship in Epilepsy and Neurophysiology at the National Hospital for Neurology and Neurosurgery, Queen Square, in London, England.
- Registered nurse, Marlee Richardson joined the epilepsy team in the new position of Epilepsy Program Nurse. Her role involves supporting patients cared for by the epilepsy program, and provides a link between Neurosurgery and Neurology.
- We added Deep Brain Stimulation (DBS) to our surgical treatments – thanks to Drs. Restrepo and Weise.
Halifax Surgical Epilepsy (cont’d)

Research
Team members are engaged in clinical and basic science research, including drug trials, neuropsychological profile development, and brain stimulation and imaging techniques/modalities.

Restrepo CE, Clarke DB, McNeely PD, Weise LM. The accuracy of 3D fluoroscopy (XT) vs computed tomography (CT) registration in frame-based stereo-electroencephalography (SEEG) surgery. American Epilepsy Society meeting. Virtual, December 2020.

Future Directions
• The Epilepsy Program is dedicated to continually seeking out contemporary ways to improve all aspects of our comprehensive epilepsy program for the people of Nova Scotia and Atlantic Canada.

Team Members
• Dr. David Clarke, Neurosurgeon
• Dr. Dan McNeely, Neurosurgeon
• Dr. Lutz Weise, Neurosurgeon
• Dr. Ben Whatley, Neurologist
• Dr. Kristin Ikeda, Neurologist
• Dr. Stephanie Woodroffe, Neurologist
• Dr. Carlos Restrepo, Neurosurgery Fellow
• Marlee Richardson, Epilepsy Program Nurse
• Dr. Antonina Omisade, Neuropsychologist
• Dawnette Benedict-Thomas, Psychometrist
• Dr. Matthias Schmidt, Neuroradiologist

Team Members (cont’d)
• Dr. Mark Rubens, Psychiatrist
• Karen Legg, Epilepsy Nurse Practitioner
• Michael Whitehead, Team Lead for EEG/EMG lab
• Philip Godwin, EEG Technologist
• Dadel Gayala, EEG Technologist
• Debbie MacDougall, EEG Technologist
• Andrew Kennedy, EEG Technologist
• Heather Smith, Social Worker
• Dr. David Skidmore, Geneticist
• Maher Quraan, MEG unit
• Dr. Tim Bardoisile, Medical Physicist
• Ron Hill, Technology Coordinator
• Haley Power, Technology Coordinator
• Murray Hong, Neurosurgery OR Technical Specialist
• Diane Jardine, Administrative Assistant
• Cathy Caron, Administrative Assistant
• Pam Slauenwhite, Administrative Assistant

Team Collaborators
• Neuropathology
• Neuroscience and Perioperative Staff
• Biomedical Translational Imaging Centre Staff (BIOTIC)
• Health Services Managers
• Biomedical Engineering
• Sterile Processing
• EMU/7.4 Inpatient Unit

BACK (LEFT TO RIGHT): Dr. J. Dawe, A. Kennedy, Dr. M. Sadler, Dr. D. Clarke, K. Legg, Dr. K. Ikeda
FRONT (LEFT TO RIGHT): D. MacDougall, S. Rahey, Dr. A. Omisade, Dr. S. Woodroffe
**Neurosurgery Simulation/Technology Program**

**Director:** Dr. David Clarke  
**Technology Coordinator:** Ron Hill, Haley Power  
**OR/Technical Specialist:** Murray Hong  
**Research Associate:** Nelofar Kureshi

Rapid technological advances have enabled simulation training to provide reality-based learning experiences for clinician trainees for our next generation of health care professionals. These customizable simulation platforms provide new and augmented educational programs that focus on required skills traditionally practiced in clinical settings.

Current technology, coupled with the needs of advancing health care systems, dictates a strong need for simulation-based learning opportunities for all health care professionals. Simulation supports a cost-effective, accessible and timely system to support well trained practitioners in the delivery of safe health care, with the ultimate goal of improved patient outcomes.

**Mission**
- To develop and expand simulation-based educational environments for healthcare trainees and inter-professional teams.
- To engage in research and knowledge translation of simulation/technology-based education and treatment.

**Goals**
- Enhance education and skills for health care professionals through simulation-based training.
- Work to develop and incorporate technologies that will be useful in the OR environment.

**Research**
- Virtual Reality (VR) Training for Medical Device Reprocessing (MDR) staff: this study will evaluate whether PeriopSim™ VR improves efficiency of surgical instrument identification in MDR staff. Participants will be recruited from NSHA Central and Northern zones. This study is on hold due to COVID restrictions.
- Simulation Training for Perioperative Orthopedic Nurses using Digital Instrument Recognition (the PONDIR study) – effectiveness and health economic implications (Principal Investigator: Dr. R. Hurley). This study seeks to determine the effectiveness of tablet-based simulation training for common orthopedic procedures. Recruitment of participants is underway.
- Robotic technology for stereotactic procedures: Pre-clinical Evaluation of the Stealth AutoGuide Robotic Guidance Device for Stereotactic Cranial Surgery; a Human Cadaveric Study. This study, in cooperation with Medtronic Canada, aims to examine the preclinical use and accuracy of a novel robotic device that may have use in neurosurgical centres worldwide (Investigators: Drs. D. Brandman, M. Hong and D.B. Clarke).

**Grant**
Optimization & Validation of a Novel Emergency Department Point-of-Care MRI: Research Nova Scotia Innovation Trust - Innovation Grant and Atlantic Canada Opportunities Agency (ACOA) - Business Development Program (BDP) Award

Principal Investigator: Steven D. Beyea  

$1,260,160.04 (RNST) and $700,000 (ACOA).

**Team Members**
- Dr. David Clarke, Neurosurgeon  
- Ron Hill, Neurosurgery, Technology Coordinator  
- Haley Power, Neurosurgery, Technology Coordinator  
- Murray Hong, Neurosurgery OR/Technical Specialist  
- Nelofar Kureshi, Research Associate

**Team Collaborators**
- Dr. Richard Hurley, Orthopedic Surgery  
- Dr. Steven Beyea, BIOTIC  
- Dr. Chris Bowen, BIOTIC  
- Dr. Ryan D’Arcy, Department of Computing Science, Simon Fraser University  
- Denise Lalanne, Biomedical Translational Imaging Centre (BIOTEC)  
- Conquer Experience, BC
Cerebrovascular Program

**Director:** Dr. Gwynedd Pickett  
**Coordinator:** Judith Jarrett

The Cerebrovascular Program is a multi-disciplinary program involving neurosurgeons, neuroradiologists, stroke neurologists, nurses and trainees in each of these disciplines. Halifax is the tertiary/quaternary referral centre for the treatment of complex cerebrovascular disorders in Atlantic Canada, with extensive experience in surgical and endovascular management of aneurysms and arteriovenous malformations (AVM), and a stereotactic radiosurgery program for the treatment of patients with AVMs. The cerebrovascular team meets weekly to discuss clinical cases and provide recommendations for an evidence-based approach to patient care.

**Mission**  
Our team is dedicated to providing world class, innovative, patient-centered care for patients with cerebrovascular disorders.

**Program Goals**  
- To treat patients with cerebrovascular disorders using the latest technology.  
- To advance the knowledge and techniques for the treatment of cerebrovascular disorders through education and research.  
- To translate research into evidence-based practice.

**Research**  
Despite the COVID pandemic, we have had an active year in research, participating in several multi-centre studies and local investigator driven studies as listed below. We maintain a number of databases (data collection from the hospital electronic medical records system) that provide valuable information for local research endeavors.

**Ongoing Multi Centre Studies**

- **STAT** — Stenting in the Treatment of large, wide-necked or recurring intracranial Aneurysm Trial. Recruitment on hold due to COVID. Principal Investigator for the QEII Health Sciences Centre: Dr. GE Pickett.

- **ECST-2**: The 2nd European Carotid Surgery Trial: A multi-centre randomized controlled open prospective clinical trial with blinded outcome assessment. 21 subjects enrolled, currently in follow-up both via phone and in clinic. (Funding: $33,547.00). Principal Investigator for the QEII Health Sciences Centre: Dr. GE Pickett.

- **REACT**: A prospective, multi-centre, double-blind, randomized, placebo-controlled, parallel-group, Phase 3 study to assess the efficacy and safety of clazosentan in preventing clinical deterioration due to delayed cerebral ischemia (DCI), in adult subjects with aneurysmal subarachnoid hemorrhage (aSAH). Recruitment on hold due to COVID, one subject enrolled. (Funding: $250,000.00). Principal Investigator for the QEII Health Sciences Centre: Dr. GE Pickett.

- **ENRICH-AF**: A prospective, multi-centre randomized clinical trial assessing the safety of edoxaban for stroke prevention in patients with atrial fibrillation who have had intracranial hemorrhage. Full approval was received from the REB and we have just been granted permission to enroll as of December 2020. (Funding: $91,750.00). Principal Investigator for the QEII Health Sciences Centre: Dr. S Phillips.

- **ACT EAST**: A pragmatic quality improvement trial funded by CIHR aimed at improving access and efficiency of acute stroke treatment in Atlantic Canada. Principal Investigator: Dr. N Kamal.

- **EVOLVE**: A phase 3 multi-centre randomized study evaluating oral peri-operative acetylsalicylic acid in subjects undergoing endovascular coiling-only of unruptured brain aneurysms. We have been accepted as a North American site and are in the REB approval process. (Funding: $40,000.00). Principal Investigator for the QEII Health Sciences Centre: Dr. A Weeks.

- **CREST2**: Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial. We have been accepted as a North American site and have received full approval from the REB. Principal Investigator Dr. C Herman.
Ongoing Local Studies

- Management of ruptured intracranial aneurysms: clinical outcomes over 15 years post-ISAT. Principal Investigator Dr. GE Pickett. Submitted for publication.

- 3D Printed Models: can they assist with information transfer and satisfaction when treating intracranial aneurysms? Recruitment on hold due to COVID pandemic. Co-Principal Investigators Dr. AC Weeks, Dr. GE Pickett.

- Evaluation of the Unruptured Intracranial Aneurysm Treatment Score: how does it compare with treatment decisions made by a multi-disciplinary team? Principal Investigator Dr. GE Pickett. Submitted for publication.

- CT Perfusion Imaging to Predict Vasospasm in Subarachnoid Hemorrhage (Funding: $25,000.00). Principal Investigator Dr. GE Pickett.

- Magnetic Resonance Imaging of Neurological Involvement in COVID-19 (Funding: $75,000.00). Principal Investigator Dr. D Volders.

Events and Accomplishments

This year, the Division of Neurosurgery welcomed a new colleague, Dr. Stephen Lownie, a senior neurosurgeon who for many years practiced both cerebrovascular surgery and endovascular intervention in London, Ontario. He trained in surgery under Canadian cerebrovascular legend Dr. Charles Drake, and was the first dual-trained surgeon/interventionalist in Canada. He is also a highly experienced skull base surgeon and his practice in Halifax will focus primarily on that, but we are delighted to have his wisdom and perspective contributing to our cerebrovascular team discussions. Meanwhile, Dr. Sean Taylor joined the Division of Neurology in March 2020, bringing subspecialty expertise in stroke neurology, neuromuscular disease, and autonomic nervous system disorders. Susannah Piercy, RN, joined the neurovascular group as a research coordinator with Neurology.

In September, the stereotactic radiosurgery program underwent a virtual site visit and review for Novalis Certification. This review was an independent audit of all stereotactic radiosurgery policies, procedures, workflows, and approaches, with an in-depth evaluation focused on quality improvement, safety and self-assessment. Certification demonstrates that a program offers a full range of clinical capabilities and practices to the highest standards. Commendation was given to the detail in our individual site protocols and the thoroughness of the audit report: a solid tribute and acknowledgement to the hard work and team effort of the stereotactic radiosurgery and Novalis working groups over the past few years. In early December, we were formally awarded Novalis Certification, becoming the first Canadian site to receive this accolade.

In November, two new angiography suites opened at the Halifax Infirmary. These units replace older ones at the VG Hospital, and expand our neurointerventional capability significantly. We now have two neuro biplane units available, allowing us to respond more quickly in cases of acute stroke. The new rooms have been built to state-of-the-art standards that not only meet the needs of today, but have the capacity to be expanded into hybrid operating rooms in the future as plans for the Halifax Infirmary expansion unfold.

The Brain Aneurysm Support Group has been meeting regularly since October 2006 providing an opportunity for brain aneurysm patients and families to share information, give and receive emotional support, educate each other, identify needs and access further resources. The COVID pandemic this year has brought challenges to the program as we have been unable to meet in person. We have been in regular communication with group members through email and over the phone providing support as needed.

Future Directions

Program members continue to work together to improve the care of patients with cerebrovascular disorders in Nova Scotia and the Atlantic Provinces. The stereotactic radiosurgery program will have an on-site follow-up review for the Novalis Certification award in the coming year (travel restrictions permitting). We have been invited to participate in new, externally funded multicentre studies both nationally and internationally, in the areas of carotid atherosclerotic disease and aneurysm treatment, and eagerly anticipate joining these endeavors.

Posters


Cerebrovascular Program (cont’d)

**Publications**


**Invited Lectures**
Pathophysiology, Diagnosis and Management of Vasospasm. Dr. GE Pickett, Ottawa Review, Feb 2020.

**Team Members & Collaborators**
- Dr. Gwynedd Pickett, Director, Neurosurgeon
- Judith Jarrett RN CCRP, Research Coordinator
- Susannah Piercey RN, Research Coordinator
- Carole-Ann Miller, Specialty Nurse Practitioner
- Dr. Adrienne Weeks, Neurosurgeon
- Dr. Stephen Lownie, Neurosurgeon
- Dr. Gordon Gubitz, Neurologist
- Dr. Stephen Phillips, Neurologist
- Dr. Sean Taylor, Neurologist
- Dr. William Maloney, Neuroradiologist
- Dr. Robert Vorderoe, Neuroradiologist
- Dr. Matthias Schmidt, Neuroradiologist
- Dr. Jens Heidenreich, Neuroradiologist
- Dr. David Vorders, Neuroradiologist
- Dr. Adela Cora, Neuroradiologist
- Katharine Anderson, Administrative Assistant
- Emma Gillespie-Fraser, Administrative Assistant
- Liz Scott, Administrative Assistant

BACK (L TO R): Dr. A. Weeks, Dr. L. Green, Dr. S. Phillips, Dr. M. Schmidt, J. Jarrett
FRONT (L TO R): C-A. Miller, Dr. G. Pickett, Dr. G. Gubitz
Brain Tumour Program

Program Co-Chairs: Drs. Adrienne Weeks and Mary McNeil
Brain Tumour Nurse Coordinator: Samantha Warren/Megan Lambert
Research Coordinator: Andrea L.O. Hebb

The Brain Tumour Program is a multidisciplinary program involving neurosurgeons, medical oncologists, radiation oncologists, neuropathologists, neuroradiologists, nurses, and trainees of each of these disciplines. Weekly meetings of the Neuro-oncology cancer site team provide evidence-based recommendations for patient management. This team organizes visiting speakers and rounds and is responsible for the development of provincial guidelines for the management of patients with brain tumours.

The Brain Tumour Group is actively participating in both clinical and basic science research programs.

Dr. Weeks runs a laboratory at the Charles Tupper Building on the Dalhousie Campus. Her lab team studies the role of RNA stress granules in the malignant brain tumour, Glioblastoma.

Dr. Weeks and Dr. McNeil are currently bringing a research team together to study Glioblastoma survivorship and patient perceptions and attitudes toward medically assisted death. This project will hopefully improve our communication and delivery of care to brain tumour patients. Dr. McNeil was the lead site director of the CCTG Trial CEB, randomizing patients to Marizimib for Glioblastoma that was completed this year.

Our annual fundraiser “Brain Cancer Bash” was put on hold this year due to COVID-19. Please look out for it in the QEII News for November 2021.

Team Members
- Dr. Adrienne Weeks, Neurosurgeon, Co-Chair CNS CST
- Dr. Mary McNeil, Medical Oncologist, Co-Chair CNS CST
- Dr. Simon Walling, Neurosurgeon
- Dr. Dan McNeely, Neurosurgeon
- Dr. Steve Lownie, Neurosurgeon
- Dr. David Clarke, Neurosurgeon
- Dr. Gwynedd Pickett, Neurosurgeon
- Dr. Sean Christie, Neurosurgeon
- Dr. Sean Barry, Neurosurgeon
- Dr. Dhany Charest, Neurosurgeon, Moncton
- Samantha Warren, Neurosurgery Brain Tumour Nurse Coordinator
- Megan Lambert, Neurosurgery Brain Tumour Nurse Coordinator
- Andrea Hebb, Neurosurgery Research Coordinator
- Dr. Sid Croul, Neuropathologist
- Dr. Alex Easton, Neuropathologist
- Dr. Kwamena Beecham, Radiation Oncologist
- Dr. Liam Mulroy, Radiation Oncologist
- Dr. Lara Best, Radiation Oncologist
- Dr. Michael Ha, Radiation Oncologist
- Dr. Robert Vandorpe, Neuroradiologist
- Dr. Adela Cora, Neuroradiologist
- Heather MacKenzie, Coordinator, Cancer Care Nova Scotia
- Erin Little, Research Coordinator
- Emma Gillespie-Fraser, Administrative Assistant
- Liam Rappoldt, MSc Student
- Kathleen Atwood, Post-Doctorate Student

BACK (LEFT TO RIGHT): H. MacKenzie, Dr. J. Shankar, Dr. R. Vandorpe, Dr. A. Weeks, Dr. S. Croul, Dr. S. Walling, Dr. D. Clarke
FRONT (LEFT TO RIGHT): Dr. Badahdah, Dr. M. MacNeil, M. Brinson, A. Hebb, Dr. D. McNeely
Neurotrauma and Injury Prevention Programs

**Director:** Dr. David Clarke  
**Research Coordinator:** Lorelei Audas  
**Research Associate:** Nelofar Kureshi  
**Research Assistant:** Coralea Carey

Traumatic Brain Injury (TBI) is the leading cause of mortality and acquired disability in Canadians under the age of 40. Direct and indirect costs associated with TBI are estimated at 3.0 billion dollars annually in Canada. In the context of the aging Canadian population, total indirect costs predicted by simulated epidemiology are projected to be $8.2 billion for TBI by 2031.

The Neurotrauma and Injury Prevention programs are dedicated to conducting research for preventative strategies and improved clinical management for TBI patients and their families. We aim to deliver targeted, evidence-based injury prevention and clinical programming for TBI care.

**Mission**  
Provide leadership in injury prevention and neurotrauma research, advocacy, education and knowledge translation.

**Goals**  
Participate in national traumatic brain injury research.

Support evidence-based care solutions that improve access to neurosurgical care, reduce lengths of stay and optimize patient outcomes.

Implement and support advocacy efforts for neurotrauma injury prevention.

**Research**

- Halifax is a member site of the Canadian Traumatic Brain Injury Research Consortium (CTRC), a partnership of Canadian basic and clinician scientists focused on TBI research (Dr. Clarke, member).

- TBI database: all TBI admissions to Neurosurgery are reviewed at TBI teaching and quality rounds, overseen by Dr. David Clarke and Dr. Simon Walling. Currently, 2,776 cases have been reviewed for inclusion in the TBI database.

- We are the only Atlantic Canadian site participating in the “National Study of Impaired Driving in Canada” led by Dr. Jeff Brubacher and locally by Drs. David Clarke and Kirk Magee. This study will measure the prevalence of drug use, and type of drugs used, in drivers who are moderately or severely injured in a motor vehicle crash. We have collected > 150 samples since study inception.

- “The impact of intoxication on mortality in patients with major traumatic brain injury caused by off-road vehicle crashes” is a sub study of “The investigation of the incidence and economic burden of alcohol-related traumatic brain injury in Nova Scotia”, which is a joint partnership with the Department of Health and Wellness and Trauma Nova Scotia. Between 2002-2014 there were a total of 176 cases of major TBI involving both drivers and passengers of off-road vehicles. Additional data for 2015-2019 were obtained from Trauma Nova Scotia and an updated manuscript describing the epidemiology of major TBI is being prepared for submission.

- “A National Biobank and Database for Patients with Traumatic Brain Injury “: we have enrolled 23 participants in this CanTBI study. This study is now closed for enrollment and follow-up study procedures have been completed.

- We have completed a pilot study “Usage of impact monitoring sensors to monitor head impact burden, concussion incidence, and traumatic microvascular injury in university football players” (led by Dalhousie Medical student, Casey Jones) which recruited five participants over a three-week period. This study utilizes impact-detecting helmets in an entire university gridiron football team. The next phase of this study is on hold due to COVID-19 restrictions.
Funding and Grants
Health Canada (Substance Use and Addictions Program – SUAP), 2019-2022
“Monitoring and Preventing Drug-Impaired Driving in Canada”
Principal Investigator: Jeff Brubacher
Co-Investigators: Herbert Chan, Shannon Erdelj, Mark Asbridge, Robert Mann and the Canadian Drug-Impaired Driving Research Team (David B. Clarke, Raoul Daoust, Philip Davis, Marcel Emond, Chrystal Horwood, Rao Jagadish, Glenda Kaban, Jacques Lee, Kirk Magee, Eric Mercier, Judy Morris, Brian Rowe, Christian Vaillancourt, Erin Weldon, Ian Wishart)
Duration of support: 3 years (June 2019 - May 2022)
$1,361,356

Department of Health Promotion and Protection, 2013-current
Principal Investigator: David B. Clarke
Co-investigators: Simon Walling, Nelofar Kureshi, Rob Green, Mete Erdogan
$20,000

Team Members
• Dr. David Clarke, Neurosurgeon
• Dr. Simon Walling, Neurosurgeon
• Nelofar Kureshi, Research Associate
• Lorelei Audas, Research Coordinator
• Coralea Carey, Research Assistant
• Casey Jones, RIM student

Team Collaborators
• Dr. Alon Friedman, Department of Medical Neuroscience
• Dr. Christina Atkinson, Department of Family Medicine
• Dr. Kirk Magee, Department of Emergency Medicine
• Dr. Robert Green, Department of Critical Care and Trauma Nova Scotia
• Brain Repair Centre
• Department of Physical Medicine and Rehabilitation
• Department of Health Promotion and Protection
• Atlantic Collaborative for Injury Prevention
• Parachute (ThinkFirst) Canada
• Emergency Health Services

More than 90% of all brain injuries are preventable.
Halifax Neuropituitary Program

Program Co-Chairs:
Drs. David B. Clarke and S. Ali Imran

Mission
Our team is dedicated to providing world class, innovative care for patients with pituitary/parasellar tumours.

Objectives
- To provide a comprehensive, multi-disciplinary, patient-focused team.
- To be leaders in delivering accessible and innovative health care for patients with pituitary disorders.
- To create an environment that fosters education and research.

This program, unique to the Atlantic Provinces and much of Canada, provides comprehensive care to over 2000 patients with pituitary and sellar region tumours in a multi-disciplinary clinic. Patients are seen by both Neurosurgery and Endocrinology. Collaboration with the Stereotactic Radiosurgery Group, Otolaryngology and Ophthalmology ensures coordinated assessment, treatment and follow-up. Monthly multi-disciplinary teleconference rounds are held with external sites from Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador.

Our program referrals included 24 new HNP surgical referrals, coming from Prince Edward Island (n=4), New Brunswick (n=1), Newfoundland and Labrador (n=1) and Nova Scotia (n=18).

There were 74 new HNP medical referrals, from New Brunswick (n=3), Alberta (n=1), Ontario (n=1) and Nova Scotia (n=69).

There were 348 patient visits to the HNP medical clinic and 360 patient visits to the HNP surgical clinic in 2020.

Thirty transsphenoidal surgeries were performed endoscopically in 2020 by Drs. David Clarke (Neurosurgery) and Emad Massoud (Otolaryngology).

In addition, we have treated our 16th patient as part of our Health Canada approved clinical trial on the stereotactic intracavitary instillation of 90yttrium for treatment of cystic sellar/parasellar lesions (Principal Investigator: Dr. Clarke). The clinical trial is being performed in collaboration with Dr. Steven Burrell and Dr. George Mawko in the Department of Diagnostic Imaging, QEII Health Sciences Centre.

Research/Program Development
In collaboration with Dr. Andrew Orr, Department of Ophthalmology we are continuing to collect sellar/parasellar tumour tissue intra-operatively under the protocol “Functional and Genetic Analysis and Banking of Neuro-Oncological Disease Tissues”. We hope to develop a better understanding of the genetic and functional pathways that confer an increased risk of developing and perpetuating neuro-oncological diseases, including neuropituitary tumours.

Our Health Canada Phase III clinical trial “Assessment of the Efficacy of Stereotactic intracavitary instillation of 90yttrium colloid for treatment of cystic lesions of the pituitary and surrounding areas (sellar/parasellar region)” has recruited 18 patients (16 patients treated, 2 patients unenrolled).
**Poster Presentations/Publications**


**Education**

We held our first “Transnasal Surgery Course” on October 22, 2020 at the QEII Skills Centre. This all-day cadaver-based course included lectures by faculty (Drs. Alsuwaihel, Massoud and Clarke) and was attended by all the neurosurgery residents. We would like to thank Murray Hong, Haley Power and the staff of the Skills Centre for a highly successful educational event.

http://www.acromegaly-support.ca

**Team Members**

- Dr. David B. Clarke, Neurosurgery
- Dr. S. Ali Imran, Endocrinology
- Andrea L.O. Hebb, Neurosurgery Research Coordinator
- Lisa Tramble, Endocrinology Clinic Nurse
- Raven Glasgow, Program Clinic Coordinator
- Dr. Emad Massoud, Otolaryngology
- Diane Jardine, Neurosurgery Administrative Assistant
- Murray Hong, Neurosurgery OR Technologist
- Dr. Sidney Croul, Neuropathology
- Dr. Liam Mulroy, Radiation Oncology
- Dr. Steven Burrell, Diagnostic Radiology
- Dr. George Mawko, Diagnostic Radiology
- Dr. Deborah Zwicker, Endocrinology, Sydney, NS
- Dr. Vicki Munro, Endocrinology, Saint John, NB
- Dr. Lenley Adams, Internal Medicine, Charlottetown, PEI
- Dr. Zaina Albalawi, Endocrinology, St. John’s, NL
- Dr. Carol Joyce, Endocrinology, St. John’s, NL
- Dr. Cathy Murray, Endocrinology, St. John’s, NL
- Dr. Michael Pelkey, Endocrinology, Fredericton, NB

**Team Collaborators**

- Neuroradiology
- Nova Scotia Eye Centre
- Operating room/7.3 Inpatient Unit/Clinic nursing
Maritime Lateral Skull Base Program

Program Co-Directors: Drs. David Morris and Simon Walling  
Program Coordinator: Andrea L.O. Hebb

The Maritime Lateral Skull Base Clinic provides coordinated care through Otolaryngology, Neurosurgery and the Stereotactic Radiotherapy Group to patients with unilateral or bilateral vestibular schwannomas (also called acoustic neuromas) and a range of other lateral skull base tumours.

The program provides coordinated care to over 900 patients with a range of lateral skull base tumours including vestibular schwannomas, other cerebellopontine angle (CPA) tumours, lesions of the petrous apex and jugular foramen. Patients are carefully assessed and appropriate plans formulated.

When treatment is required, the experts on our team provide a full range of treatment options including surgery, stereotactic radiation therapy (SRT), as well as balance and hearing rehabilitation.

Our program is unique in Canada in allowing members from all disciplines to formulate management decisions in the same clinic.

Neurofibromatosis Type 2 is a hereditary condition (autosomal dominant, spontaneous and mosaic) most commonly associated with bilateral vestibular schwannomas. NF2 clinics continue to be held once every 2nd month. This clinic is dedicated to patients with Neurofibromatosis Type 2 and includes collaboration with Medical Genetics, Radiology, Nova Scotia Hearing and Speech as well as Ophthalmology. We currently follow over 30 patients with NF2.

Dr. Stephen Lownie, Neurosurgery, joined the MLSBC in 2020.

Dr. Gaurav Chawdhary, Neuro-Otology fellow, Oxford, United Kingdom joined our team in July 2020.
Number of Patients Seen by Year in Maritime Lateral Skullbase Clinic

In 2020, due to the COVID-19 pandemic telephone visits were more widely adopted.

Number of New Diagnostics by Year and Province in Maritime Lateral Skullbase Clinic

Referrals are received across Canada with the majority from the Maritime Provinces. The number of new patients seen by year per province is outlined.
Maritime Lateral Skull Base Program (cont’d)

Number of Patients Treated Each Year in Maritime Lateral Skullbase Clinic

The number of patients treated with SRT/SRS or surgery are outlined per year since 2009.

Clinic Visits

561 clinic visits occurred in 2020. There were 323 in-clinic visits and 169 virtual visits for returning patients. There were also 69 new referrals in 2020, to include 14 patients from NB, 3 patients from PEI, 2 patients from NL and 50 patients from NS. Dr. Simon Walling performed 8 surgeries (with Dr. Stephen Lownie, Dr. David P. Morris and Dr. Nael Shoman) to remove CPA tumours in 2020.

In addition, 14 patients underwent stereotactic radiation therapy (SRT) to control tumour growth. The lower numbers of patients treated relative to previous years may be due to the coronavirus pandemic.

Program Goals

• To offer a single center, multi-disciplinary approach
• To be an internationally recognized centre for lateral skull base lesions
• To be at the forefront of clinical research in lateral skull base lesions
• To maintain a detailed database allowing critical appraisal of current treatment strategies
• To be sensitive to new developments in our specialty allowing us to be critical of our practice and outcomes
• To change our practice in light of evidence based research
Research in the Skull Base Program

- Quality of life related to symptomatic outcomes in patients with cerebellopontine angle tumours.
- High-resolution vestibulocochlear schwannoma imaging on 0.5 Tesla MRI.

We have developed several research fronts in this program. Some are listed below:

- What is useful hearing? Speech in noise comprehension with asymmetric hearing in acoustic neuroma subjects, when does the tumor ear stop contributing to binaural hearing?
- Database of tumor growth and outcomes. One of the largest series in the world with the “wait and scan” policy.
- Defining the natural history of vestibular schwannoma as a foundational precept of a statistical model.
- Database of surgical outcomes: looking at facial nerve displacement.
- Patient expectations and attitudes to acoustic neuroma: questionnaire for all patients in our database.
- Subjective hearing handicaps measured with standardized instruments.
- Tinnitus and quality of life questionnaires added to each clinic visit.

Publications


Team Members

- Dr. Simon Walling, Neurosurgeon
- Dr. David P. Morris, Otolaryngologist
- Dr. Nael Shoman, Otolaryngologist
- Dr. Stephen Lowrie, Neurosurgeon
- Dr. Liam Mulroy, Radiation Oncologist
- Andrea L.O. Hebb, Program Coordinator
- Bonita Meade, Clinic Coordinator
- Adele Greene, Clinic Nurse
- Jenny Barron, Clinic Nurse
Pediatric Neurosurgery

The goal of the Division of Neurosurgery at the IWK Health Centre is to offer the highest quality clinical service to pediatric patients of the region, in collaboration with our colleagues at referring sites. We also strive to offer high quality teaching, and to contribute to the advancement of knowledge through our participation in research.

Camp Brainiac at Brigadoon was put on hold during the summer of 2020; we look forward to resuming an in-person camp experience during the summer of 2021. The Neurosurgery Kids Fund will continue to sponsor patients who are interested in participating.

There were quite a few changes in the Division of Neurology in 2020. Congratulations and best wishes to Kevin Gordon from the Division of Neurology upon his retirement in July 2020. Egido Spinelli also closed his practice at the IWK after a year in practice, moving to London ON. We wish him well. We welcome Pratima Gulati to the IWK Health Centre this year and look forward to working with her.

There were important changes to our nursing support over the past year. Marie MacNeil retired from the position of Neurosurgery Clinic nurse. We are very grateful for the passion and energy that she dedicated to our patients and their families. She went above and beyond the call of duty on many occasions.

Thanks to Amy Campbell who stepped into the role on an interim basis upon Marie’s retirement.

We were delighted to welcome Sarah Szego to the team as our first pediatric neurosurgery nurse practitioner in August of 2020. We are grateful to have her skills added to our care team.

Team Members and Collaborators
- P. Daniel McNeely, Chief, Pediatric Neurosurgeon
- Simon A. Walling, Neurosurgeon
- Sarah Szego, Neurosurgery Nurse Practitioner
- Kelly Boileau, Brain Tumour Clinic Nurse
- Katherine Wagner, Spina Bifida Clinic Nurse
- Shona McConnell, Neurosurgery OR Nursing Team Lead
- Susan Morris, Neurophysiologist
- Cathy Caron, Administrative Assistant
- Chrisey Shay, Administrative Assistant
Intra-Operative Neurophysiological Mapping & Monitoring (IONM)

**Neurophysiologist:** Dr. Susan Morris  
**Neurosurgery OR/Technical Specialist:** Murray Hong  
**Neurosurgery OR Technology Coordinator/Specialist:** Ron Hill

Intraoperative neurophysiological mapping and monitoring (IONM) uses electrophysiological methods to provide real-time feedback to surgeons about critical brain, brainstem, spinal cord, and nerve function during different types of neurosurgery. As a mapping technique, IONM provides functional guidance to help surgeons identify and navigate vital regions of the central and peripheral nervous system. As a monitoring tool, IONM acts as an early warning signal, enabling timely intraoperative intervention to avoid serious post-operative deficits such as paralysis. Neurosurgeries that most benefit from IONM include brain, brainstem and spinal cord tumour resections and complex spine deformity corrections.

The IONM program in the Division of Neurosurgery is collaboratively run by Drs. Susan Morris and Murray Hong, both of whom have many years of experience in intraoperative neurophysiology.

In addition to clinical work, Drs. Morris and Hong are involved in various departmental research projects. A recent project examined the timing and nature of neurophysiological signal changes in response to experimental spinal cord compression. Rapid detection of intraoperative spinal cord compromise using electrophysiological methods and the development of new IONM techniques is critically important to patient safety during spine and spinal cord surgery.

**Team Members**
- Susan Morris, Neurophysiologist  
- Murray Hong, Neurosurgery OR/Technical Specialist
Neurosurgery Basic Science Labs
Life Sciences Research Institute and Sir Charles Tupper Building
Brain Repair Centre

Spinal Cord Injury Laboratory

Dr. Sean Christie
The Christie Lab is primarily interested in understanding different molecular aspects of secondary spinal cord injury (SCI) and testing novel treatments in animal models.

Dr. Mustafa Nadi, graduate student, is studying the effects of modulating microRNA expression in SCI with neuroprotective drugs for his PhD in Medical Neuroscience. He is analyzing data from deep sequencing (Next Generation) to identify candidate microRNA that are likely targets for beneficial modulation during treatment. He presented his current findings at the Atlantic Mobility Action Project (AMAP) annual meeting in White Point, NS in October 2020. He is also the recipient of the Genomics in Medicine and IWK graduate scholarships in support of this work.

Kennedy Brittain joined the lab as our summer research assistant earlier this year. Her interest is in studying how protecting mitochondria works to rescue neurons after neurotrauma. She enrolled as a graduate student with us beginning September and is studying the effects of a novel Ruthenium complex in protecting mitochondria in neurons and enhancing neuronal survival after traumatic spinal cord injury (SCI). She presented her proposed research at the AMAP annual meeting in October. Before graduating from Saint Mary's University earlier this year with her BSc, she worked with our lab in part for her Honours thesis with our collaborators, Drs. Danielle Tokarz and Richard Cisek.

We were successful in securing funding from the Department of Surgery in May 2020 to continue last year's exploratory research collaboration with Dr. Bryan Crawford of the University of New Brunswick. We are investigating the effects of cannabis extracts on enzymes modifying the extracellular matrix and their inhibitors. This has application towards understanding mechanisms of neuropathic pain and treatment, initially in the zebrafish and mouse models.

Dr. Saranyan Pillai, research associate, is the other member of our lab. He trains students, contributes scientifically to all of our projects and supports collaborative research. His interests include testing novel combinatorial therapies with repositioned drugs in the context of SCI and extracellular matrix dynamics after SCI. The lab is also the processing node for patient samples from our basic research grants, with our many collaborators. The coming year promises to be exciting with preparations underway for more collaborative projects and the lab welcoming new members.

Brain Tumour Laboratory

Dr. Adrienne Weeks
Dr. Weeks runs a laboratory at the Charles Tupper Building on the Dalhousie Campus. Her lab team studies the role of RNA stress granules in the malignant brain tumour, glioblastoma. A recently published paper in the Nature Group Publication “Cell Death and Disease” was the first to demonstrate that interfering with stress granule dissolution by the drug raloxifene increased glioblastoma cell death. The team is exploring other drugs that impair stress granule function in the hopes of bringing new therapeutic strategies to clinic practice.


Dr. Weeks, in collaboration with Dr. Jeremy Roy at the Atlantic Cancer Research Institute in Moncton, New Brunswick and Dr. Sidney Croul in the Department of Pathology at Dalhousie have begun a translation research project to study the role of plasma extracellular vesicles in glioblastoma recurrence and pathogenesis. The group recently received a grant for Atlantic Genome Canada and the QEII Foundation to further this work.

Mr. Liam Rappoldt, a MSc Student, in Dr Weeks’ laboratory presented a poster at the Society of Neuro-oncology in November 2020 entitled, “Establishing a patient-derived, in-vitro organotypic slice culture model of GBM” as part of the project studying the role of extracellular vesicles in glioblastoma biology.

Funding
Dr. Weeks’ laboratory is supported by the Department of Surgery, QEII Foundation and Atlantic Genome Canada.

Fundraising
Our annual fundraiser “Brain Cancer Bash” was put on hold this year due to COVID-19. Please look out for it in the QEII News for November 2021.
Research Funding

Principal Investigator: Sean Christie
Department of Surgery
Neuronal Protection Following Spinal Cord Injury through Inhibition of the Mitochondrial Calcium Uniporter
2019 - 2021
$49,122

Principal Investigator: Sean Christie
Abbvie
M16-077: Elezunab in Traumatic Spinal Cord Injury
2020-2023
$367,632

Principal Investigator: Sean Christie
Medtronic Canada
Prospective Registry of Clinical Outcomes following Elective Spine Surgery
2020-2021
$40,000

Principal Investigator: Dr. Farhad Pirouzmand
Co-Investigator: Sean Christie
Canadian Institutes of Health Research
Prophylaxis for Venous Thromboembolism in Severe Traumatic Brain injury (PROTEST): A Double Blind Randomized Controlled Trial
2019 - 2023
$742,000

Principal Investigator: Dr. John Frampton
Co-Principal Investigator: Sean Christie
CRCC – New Frontiers in Research Fund - Exploration Flexible Biomaterial Fibers for Nerve Repair and Regeneration
2019 - 2021
$250,000

Principal Investigator: Dr. Sonja McVeigh
Co-Investigator: Sean Christie
Nova Scotia Health Authority Research Fund
Plasma Melatonin Levels After Acute Traumatic Spinal Cord Injury in Individuals with Complete and Incomplete Cervical and Thoracic Spinal Cord Injury
2019 - 2021
$75,000

Principal Investigator: Dr. Sonja McVeigh
Co-Investigator: Sean Christie
PRAXIS
Spinal Cord Injury Implementation and Evaluation Quality Care
2020
$78,136
Research Funding (cont’d)

Principal Investigator: Dr Ayoub Dakson
Co-Principal Investigator: **Sean Christie**
Kuwait Foundation for the Advancement of Sciences
Central Nervous System Penetration of SARS-CoV-2: Incidence and Implications
2020-2022
$23,000

Principal Investigator: **Sean Christie**
Department of Surgery
Effects of Cannabidiol on Molecular and Biochemical Indices of Neuropathic Pain
2020-2021
$14,000

Principal Investigator: **Sean Christie**
PRAXIS
RHSCIR 3.0 - Implementation of Non-Traumatic Injuries into National Dataset
2020
$60,000

Principal Investigator: Jeff Brubacher
Co-Investigators: **David B. Clarke** and several others
Health Canada (Substance Use and Addictions Program – SUAP)
Monitoring and Preventing Drug-Impaired Driving in Canada
2019-2022
$1,361,356

Principal Investigator: Alon Friedman
Clinical Site Investigator: **David B. Clarke**
Co-Investigators: Several others including **Simon Walling**
Canadian Institutes of Health Research
Microvascular Injury and Blood-Brain Barrier Dysfunction as Novel Biomarkers and Targets for Treatment in Traumatic Brain Injury
Funding over five years ($190,000 per year)
2016-2021
$950,000

Principal Investigator: **David B. Clarke**
Co-investigators: **Simon Walling**, Nelofar Kureshi, Rob Green, Mete Erdogan
Department of Health Promotion and Protection
An Investigation of the Health and Economic Outcomes of Alcohol-Related Traumatic Brain Injury in Nova Scotia
2013-2020
$20,000

Principal Investigator: Kevin Chen
Co-Investigators: **David B. Clarke**, SA Imran, M. Ladouceur
Department of Medicine, University Internal Medicine Research Foundation (UIMRF)
Exploring the Impact of Arthritis in Acromegaly Patients and the Associated Changes in Joint Biomechanics Compared with Able-Bodied Individuals
2020
$25,000

Principal Investigator: Steven Beyea
Co-Applicant: **David B. Clarke**
Brain Repair Centre, 2020 Knowledge Translation Grant Program
Optimized MRI Acquisition & Reconstruction Technologies for Screening MRI in Emergency Medicine: An Innovation Partnership with Synaptive Medical
2020
$26,250

Principal Investigator: **Adrienne Weeks**
Atlantic Genome Canada
Genomics Opportunity Review Program (GORP)
2020
$10,000
Publications


Publications (cont’d)


Presentations


Presentations (cont’d)


Invited Lectures


Clinical Neuroscience Guest Speakers

**DR. DAVID VOLDERS**  
Topic: “Imaging and Treatment in Acute Stroke” - June 8, 2020  
Dr. David Volders is an Assistant Professor at Dalhousie University and a practicing member of the Neuroradiology team at the QEII Health Sciences Centre. As a native of Belgium, he received his training at the Catholic University of Leuven where he completed his medical school and radiology residency. After a one-year Diagnostic Neuroradiology Fellowship in the Netherlands, Dr. Volders moved to Vancouver for a two-year Fellowship in Diagnostic and Interventional Neuroradiology. After completion, he undertook a one-year position as a Neurointerventional Radiology Fellow at the Centre Hospitalier de l’Université de Montréal (CHUM). Dr. Volders has a keen interest in stroke imaging and treatment. Locally, he is the PI for Optimise, a database for acute stroke patients. On the Provincial level, he is involved in the rollout of the Provincial Stroke Care program.

**DR. JANICE CHISHOLM**  
Topic: “Narrative Feedback on Resident Evaluations” - March 11, 2020  
Dr. Janice Chisholm is an Associate Professor in the Department of Anesthesia, Pain Management and Perioperative Medicine at Dalhousie University. She completed both undergraduate and postgraduate training at Dalhousie before going on to complete a Critical Care Medicine (adult) fellowship at the University of Pittsburgh Medical Centre. She is currently the Dalhousie Competency-Based Medical Education (CBME) lead and the Anesthesia Site Chief at the Victoria General Hospital, Nova Scotia Health Authority.

**DR. MARK FREEDMAN**  
Topic: “Know NMOSD: From pathophysiology to emerging therapies” - September 16, 2020  
Dr. Mark Freedman is Professor of Medicine (Neurology) at the University of Ottawa, Senior Scientist at the Ottawa Hospital Research Institute and Director of the Multiple Sclerosis Research Unit at the Ottawa Hospital - General Campus. His extensive research includes molecular neurochemistry, cellular immunology, and clinical studies in MS. His basic science interest concerns immune mechanisms of damage in MS, with a particular interest in the role of the innate immune system such as gamma-delta T-cells. His main clinical interests are cell-based therapies for MS. He was the lead investigator of the Canadian Bone Marrow Transplant Study in MS and he co-heads an international study of mesenchymal stem cells for the treatment of MS. He is the current President-Elect of ACTRIMS.
Awards and Recognitions

W.J HOWES NEUROSURGERY TEACHING AWARD: 
DR. JACOB ALANT
This award acknowledges excellence in neurosurgery teaching by a resident, fellow or attending neurosurgeon. Dr. W.J. Howes is a neurosurgeon who had a distinguished career in Halifax from 1973-2008.

WD STEVENSON RESEARCH AWARD: 
DR. MARK MACLEAN
The WD Stevenson Research award is presented annually to a Neurosurgery Resident for outstanding contributions in basic and clinical research in Neurosurgery.
Study: A Quantitative Degenerative Lumbar Spondylolisthesis Instability Classification (DSIC) System to Reduce Variation in Surgical Treatment.

CNSS KG MACKENZIE MEMORIAL PRIZE FOR CLINICAL NEUROSCIENCE RESEARCH: 
DR. MARK MACLEAN
This is the top research prize in Canada for a neurosurgery resident – from the Canadian Neurological Sciences Federation/Canadian Neurosurgical Society. Supervised by Dr. Sean Christie and Dr. Gwynedd Pickett. “Are There Differences between Men and Women in regards to Pre-Operative Expectations and their Post-Surgical Satisfaction? A Retrospective Analysis” His research examines potential gender biases in accessing spinal surgery, including pre-operative utilization of healthcare resources.

CLINICAL NEUROSCIENCE RESIDENT RESEARCH DAY AWARDS - TOP NEUROSURGERY RESIDENT PRESENTATION: 
DR. MARK MACLEAN
Study: A Quantitative Degenerative Lumbar Spondylolisthesis Instability Classification (DSIC) System to Reduce Variation in Surgical Treatment.

CLINICAL NEUROSCIENCE RESIDENT RESEARCH DAY AWARDS - TOP OVERALL PRESENTATION: 
DR. CARLOS RESTREPO
Study: Efficacy of an Image-based programing plan in predicting the final stimulation configuration for subthalamic nucleus deep brain stimulation.

CLINICAL NEUROSCIENCE RESIDENT RESEARCH DAY AWARDS - TOP NON-RESIDENT PRESENTATION: 
RYAN GREENE
Study: Development of a Frailty Index from the Canadian Spine Outcomes Research Network (CSORN) to Predict Long Term Success of Surgery for Patients with Degenerative Pathologies of the Spine.
DEPARTMENT OF SURGERY RESEARCH DAY 2020 – BEST STUDENT PRESENTATION: CASEY JONES
Congratualtions to Casey Jones, Dalhousie Medical Student, for winning “Best Student Presentation” at Department of Surgery Research Day. Casey’s presentation was titled “Impact Detecting Helmets as Indicators of Concussion and Traumatic Microvascular Injury in University Football Players”. His research is supervised by Drs. David Clarke and Alon Friedman; co-investigators include Lorelei Audas, Nelofar Kureshi, Lyna Kamintsky, Lynne Fenerty and Dr. Christina Atkinson.

NSHA NEUROSURGERY FIRST IN CANADA TO USE NEW ROBOT FOR BRAIN SURGERY:
Dr. David Clarke was the first neurosurgeon in Canada to perform a robot-assisted brain biopsy with the Stealth AutoGuideTM, manufactured by Medtronic. Preclinical research was conducted here by Drs. Brandman, Hong and Clarke. This innovative technology has now been incorporated into our neuro-navigation system to help increase the efficiency and safety of the procedure. This Halifax-led effort was a significant step in bringing robotic neurosurgical technology into the operating room.

GREENING NOVA SCOTIA’S HEALTHCARE SYSTEM IN A COVID-19 WORLD:
Dr. Sean Christie made headlines with his initiative to create a more sustainable operating room. “The Canadian Association of physicians for the environment reports that carbon pollution from the health sector increased at double the rate of the national average between 2009 and 2015, accounting for 4.6 % of total carbon emission in Canada in 2015” (Dietz Chiasson, 2020). Dr. Christie goes on to explain that the use of single-use items in the hospital has risen significantly since he began his training in 1996. His goal is to create and coordinate a province-wide effort to green Nova Scotia’s healthcare system; he has already begun work with several partners in this effort, including Gillian Ritchey, Managing Director of the Healthy Populations Institute at Dalhousie University.

DR. SEAN CHRISTIE:
Congratulations to Dr. Sean Christie who was named the Chair of the Faculty of Medicine Dean’s Research Council for the 2021 academic year!

DR. SEAN BARRY:
Congratulations to Dr. Barry for receiving a Letter of Recognition for Excellence in Undergraduate Teaching from the Department of Surgery during the 2019-2020 academic year.

BEST ORAL PRESENTATION - 12TH ANNUAL MEETING OF THE CANADIAN NEUROMODULATION SOCIETY:
Restrepo CE, Potvin C, Weise LM. The relation of the electrode position with the development of behavioral symptoms after subthalamic nucleus stimulation.
Cross-Appointed Faculty

Department of Anesthesia
- Dr. Ian Beauprie, MD, FRCPC
- Dr. Adam Law, MD, FRCPC
- Dr. Kirk MacQuarrie, MD, FRCPC
- Dr. Orlando Hung, MD, FRCPC
- Dr. Michael Schmidt, MD, FRCPC
- Dr. Carlo Mariotti, MD, FRCPC
- Dr. Karim Mukhida, MD, FRCPC

Department of Diagnostic Radiology (Neuroradiology)
- Dr. William Maloney, MD, FRCPC
- Dr. Robert Vandorpe, MD, FRCPC
- Dr. Matthias Schmidt, MD, FRCPC

Department of Medicine (Physical Medicine & Rehabilitation)
- Dr. Christine Short, MD, FRCPC
- Dr. Sonya McVeigh, MD, FRCPC

Department of Pathology
- Dr. Alex Easton, MD FRCPC
- Dr. Sidney E. Crew, MD, FRCPC

Department of Radiation Oncology
- Dr. Liam Mulroy, MD, FRCPC

Department of Surgery (Orthopedics)
- Dr. Bill Oxner, MD, FRCS
- Dr. Ron El-Hawary, MD, FRCS
- Dr. Andrew Glennie, MD, MSc, FRCS

Department of Surgery (Otolaryngology)
- Dr. Emad Massoud, MD, FRCS
- Dr. David Morris, MD, FRCS (ORL-HNS)
- Dr. Jonathon Trites, MD, FRCS

Department of Medical Neuroscience
- Dr. Alon Friedman, MD, PhD

Affiliated Faculty

Department of Neurosurgery, The Moncton Hospital
South East Regional Health Authority, Moncton, NB
- Dr. Robert Adams
- Dr. Dhany Charest
- Dr. Charbel Fawaz
- Dr. Brendan Kenny
- Dr. Gilbert Quartery
- Dr. Antonios El Helou

Department of Neurosurgery, Saint John Regional Hospital
South East Regional Health Authority, Saint John, NB
- Dr. George Kolyvas
- Dr. Najmeeden Attabib
- Dr. Andre Le Roux

Department of Neurosurgery, Health Sciences Center
Eastern Health, St. John’s, NL
- Dr. Gerry Murray
- Dr. Andre Engelbrecht
- Dr. Greg Jenkins
- Dr. Roger Avery
- Dr. John Adams
HALIFAX NEUROSURGERY
2020 ANNUAL REPORT

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