A WORLD OF KNOWLEDGE

Our 2015-2016 Annual Report

CLINICAL
NEURO
SCIENCES
CALGARY CANADA

CLINICAL
NEURO
SCIENCES
CALGARY CANADA

Department Goals

1 To provide excellent clinical care in Neurology, Neurosurgery and Physiatry to patients in our referral area.

2 To develop clinical-academic programs in the Clinical Neurosciences of national and international stature. These programs will provide special assessment and treatment, develop and test new forms of treatment and explore disease mechanisms.

3 To provide excellent educational programs in the Clinical Neurosciences and related basic neurosciences including undergraduate courses, clerkship, residency training, postgraduate training and continuing medical education.

4 To promote and conduct clinical research and clinically relevant basic science research into diseases of the nervous system.

▲ Dr. Garnette Sutherland's pioneering work with neuroArm was featured by Calgary Economic Development as part of their Be Part of the Energy campaign in 2016.

Table of Contents

Message from the Department Head

Dr. Rajiv Midha

FOR THE PAST 35 YEARS, the Department of Clinical Neurosciences has excelled by expanding our collective knowledge to become leaders in patient care, research and education.

Over that time, we have built an enviable team of clinicians and scientists (and quite a few clinician-scientists) who are dedicated to improving care for patients today and in the years to come.

Part of that success is related to the diverse backgrounds of our faculty and the cross-pollination that comes from visiting fellows and our own members bringing world-class experiences back to Calgary.

Dr. Jay Riva-Cambrin (who is featured on Page 34) is a perfect example. Dr. Riva-Cambrin brought an innovative hydrocephalus procedure (endoscopic third ventriculostomy with choroid plexus cauterization) to our city when he joined the department last year. His training was in Boston and Uganda—now he is caring for patients in Calgary and teaching the procedure to neurosurgeons in Edmonton.

Similarly, in the past year we've been fortunate to attract **Dr. Hamid Ebadi** and **Dr. Colin Josephson**. The list is by no means complete, but a few examples of our global connections are featured on Page 4.

The fact that these physicians chose to come (or come back) to Calgary speaks well for our department. Their skills are certainly needed as we fill the large shoes of a number of retiring faculty members. We salute neurologist **Dr. Ranjit Ranawaya**, who has retired as lead of our Movement Disorder Program, and neurosurgeon **Dr. John Hurlbert**, who has moved on to the University of Arizona after leading the Neurosurgery Residency Program here.

In addition to Dr. Riva-Cambrin, Dr. Ebadi and Dr. Josephson, our department has been joined by **Dr. Ronak Kapadia, Dr. Serge Mrkobrada, Dr. Chris Huang and Dr. Darren Chiu.**

These talented physicians allow us to continue our mission, which is increasingly challenging in these economic times.

But our creative teams are ensuring we do more with less—including a trial that studied early discharge for brain injury rehabilitation patients by providing supports in the community. The "Home Sweet Home" project, led by physiatrist **Dr. Chantel Debert** and Unit 58 manager **Jason Knox,** was recognized with a CMO Quality Improvement Award.

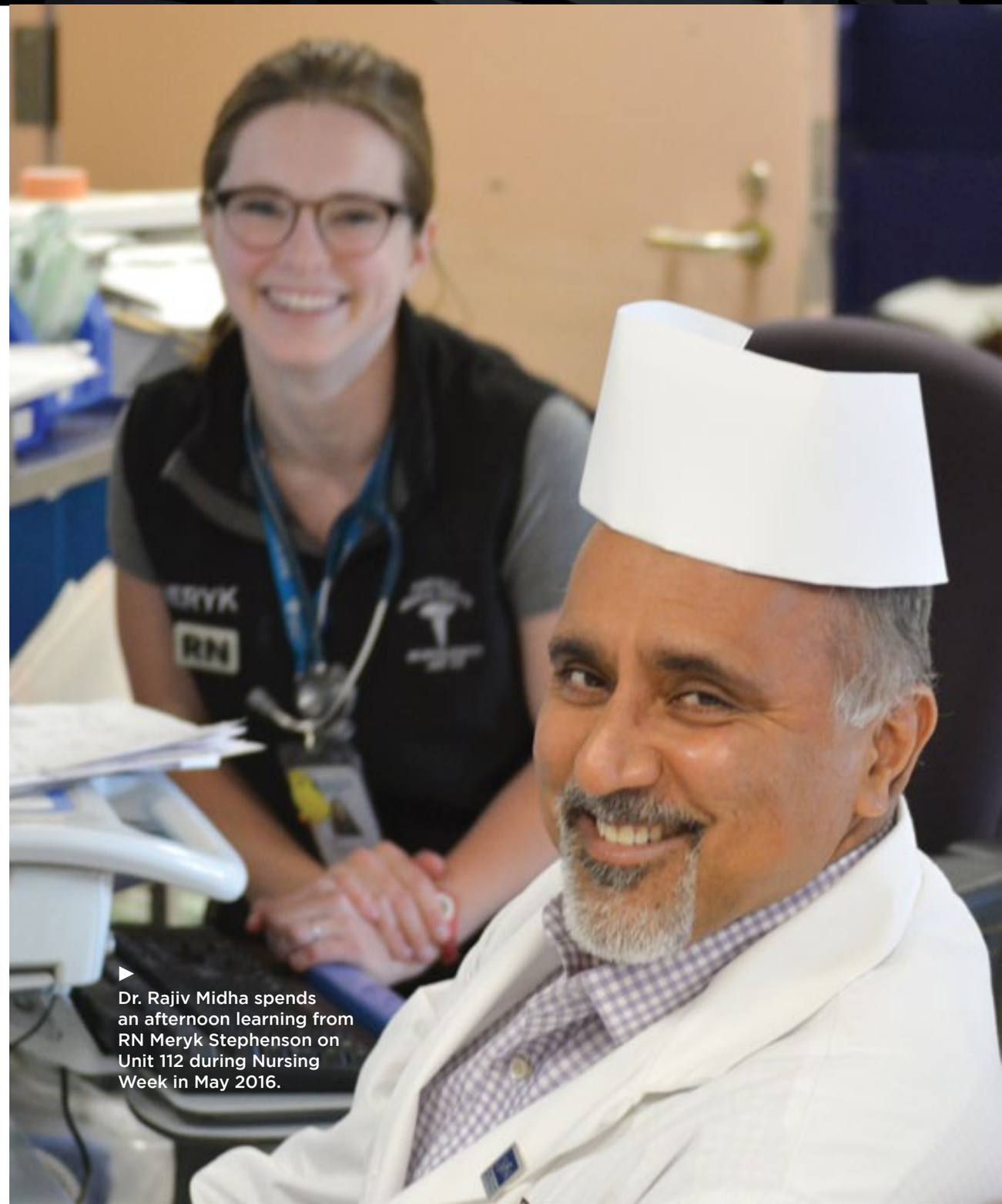
And our Spine Triage and Assessment Clinic (See Page 36) has exceeded expectations by reducing waiting times to see a specialist from months or years to weeks.

By partnering neurosurgeons with physiatrists and specially trained physicians, we've been able to divert the 80 per cent of patients who don't require spine surgery to rehabilitation or community care—freeing up neurosurgeons to devote more time to surgical cases.

Like these projects, our department measures what we do to ensure we're continually moving forward. We've included a number of these measurements in a Clinical and Academic Metrics section on Pages 6-9. These statistics showcase our achievements and help us focus on areas we can improve upon.

As always, we couldn't do any of this without the support of our entire team: nurses, nurse practitioners, fellows, locums, Allied Health professionals and our administration and support team—led by executive directors **Cathy Edmond** and **Joanne Cabrera.**.

Thank you for taking a moment to learn more about our department. We hope you enjoy our annual report.



▶ **Dr. Rajiv Midha spends an afternoon learning from RN Meryk Stephenson on Unit 112 during Nursing Week in May 2016.**

A WORLD OF KNOWLEDGE

DCNS attracts global talent to Calgary and shares expertise through fellowships

AS THE DEPARTMENT OF CLINICAL NEUROSCIENCES advances clinical care through its extraordinary research, the world is paying attention.

International success stories—such as the ground-breaking ESCAPE trial into endovascular treatment for ischemic stroke—ensure a steady of stream of fellows are eager to train in Calgary.

In fact, the Calgary Stroke Program receives two to three applicants every month and over the years has trained 69 fellows from 17 countries.

Similarly, our programs are attracting clinicians, academics and researchers looking to start or grow their careers in an environment that encourages collaboration.

"I was attracted by a world-class academic program and excellent collegiality, based on what I had heard from my friends in Toronto," says Dr. Hamid Ebadi, who joined the department last year.

Dr. Ebadi completed training at the Université Pierre-et-Marie-Curie in Paris after receiving his MD in Tehran, Iran.

Our newest recruits also include Dr. Oury Monchi, who is now Research Director of the Movement Disorders Program and Clinical Research Director of the department. Dr. Monchi brought his Parkinson's research lab from Montréal to Calgary.

Neurologist Dr. Colin Josephson came to Calgary after completing a fellowship in Scotland. "I had the privilege of conducting a clinical-research fellowship at the University of Edinburgh prior to coming to Calgary," he says.

"What struck me most about the University of Calgary is that it is the premiere institution in Canada in which I can apply the clinical, epidemiological and statistical techniques I learned abroad to improve the provision of care to people affected by epilepsy."

Dr. Josephson praised the collaborative environment he found here.

"Calgary provides an unparalleled access to the resources, infrastructure, and the sheer enthusiasm for collaborative research that I require to succeed as a clinician-scientist in neurology."

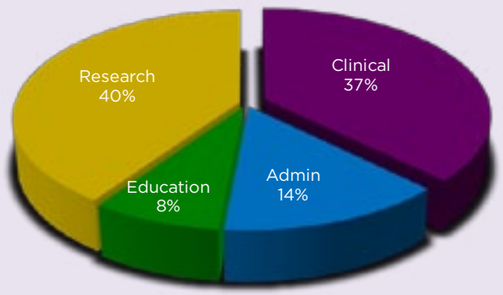
Clinical and Academic Metrics

How our department stacked up over the past year — within the Cumming School of Medicine and Alberta Health Services

(For Publications and Grants data, please visit our web site: www.ucalgary.ca/dcns/AR)

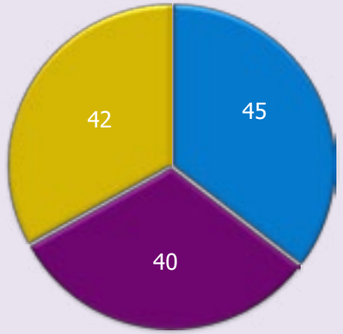
OUR DEPARTMENT

GFT –Activity Profile (42 FTE in DCNS)



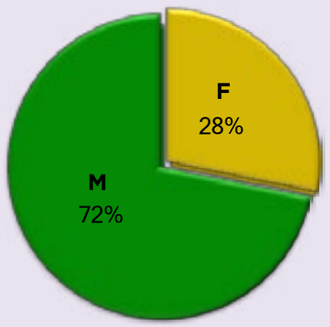
Source: Cumming School of Medicine

Appointments to Faculty in DCNS

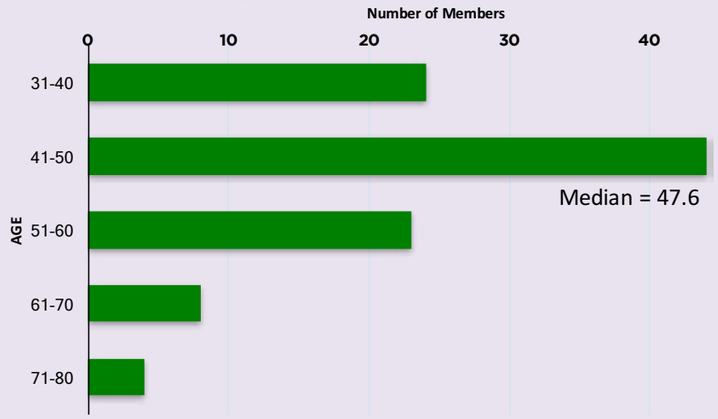


Total = 127
(includes 5 PhD scientists in Translational Neurosciences Section)

Gender

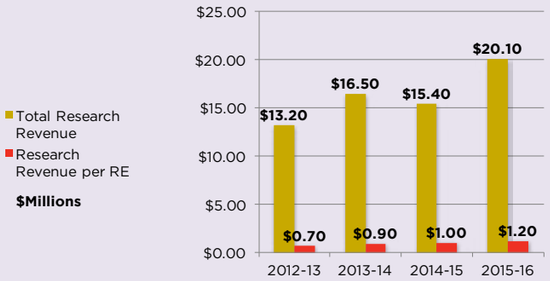


Age Distribution



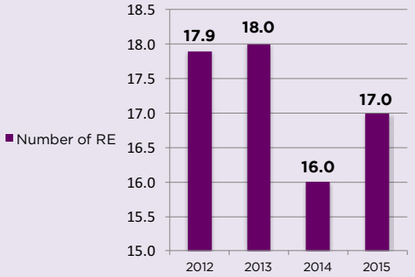
RESEARCH & PUBLICATIONS

Research Revenue



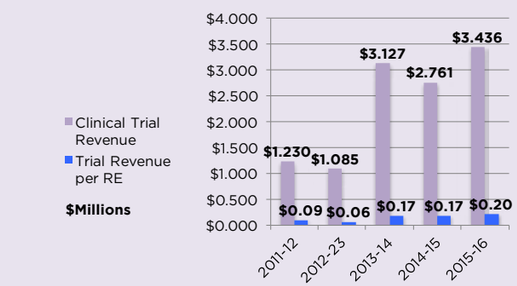
Source:
Cumming School of Medicine

Number of Research Equivalents



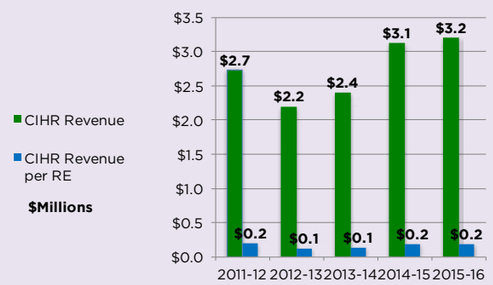
Source:
Cumming School of Medicine

Clinical Trial Revenue



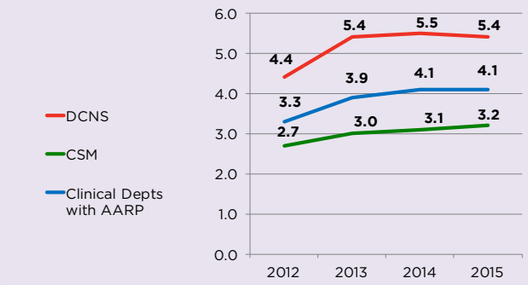
Source:
Cumming School of Medicine

CIHR Revenue



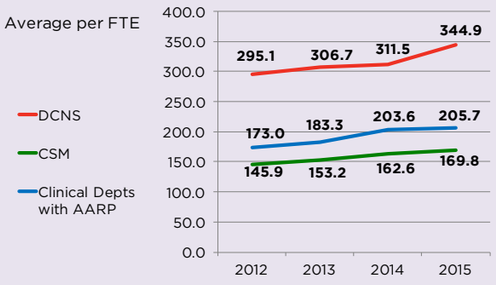
Source:
Cumming School of Medicine

Publications (avg per FTE)



Source:
Cumming School of Medicine

Publication Citations



Source:
Cumming School of Medicine

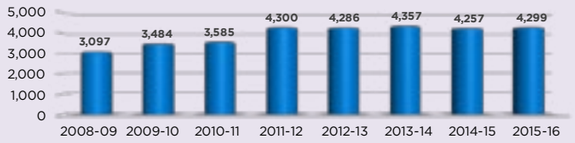
PATIENT VISITS, ADMISSIONS, SURGERY

DCNS – Total Outpatient Visits

Hospital Site	2013-2014	2014-2015	2015-2016
FMC	31,159	32,423	34,115
PLC	1,289	1,285	2,541
RGH	2,821	2,778	5,380
SHC	13,798	11,663	12,599
ACH (Ped NSx)	1,849	1,961	2,318
Total	50,916	50,110	56,953

Note: Excludes off hospital sites

DCNS – Total Admissions All Hospitals



DCNS – Total Inpatient Admissions

Hospital Site	2013-2014	2014-2015	2015-2016
FMC	3,803	3,753	3,836
ACH	211	184	168
SHC	340	318	295
RGH	3	2	0
Total	4,357	4,257	4,299

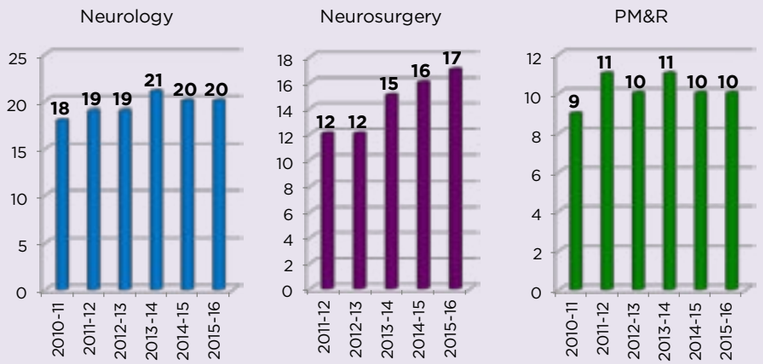
Note: Excludes off hospital sites

Surgical OR Cases Neurosurgery at FMC

RESIDENT EDUCATION

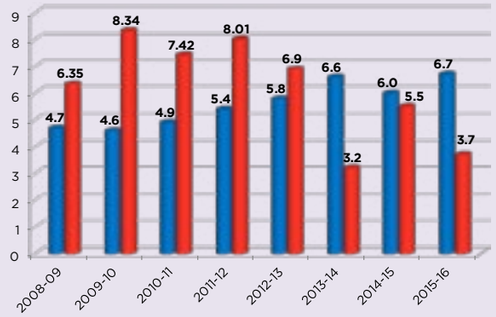
The Department of Clinical Neurosciences is exceptionally proud of our three residency programs that are home to 47 talented residents doctors.

Number of Residents per Program

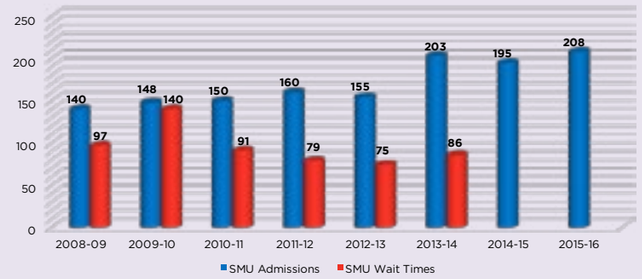


CLINIC WAIT TIMES

EMG Outpatient Volumes and Wait Times



Seizure Monitoring Unit Admissions and Wait Times

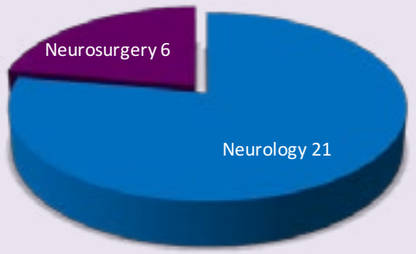


FELLOWS

Clinical Neurosciences Fellowship Program

Integral for service delivery and scholarly activity

- Cognitive
- EEG
- Stroke
- Epilepsy
- MS
- Neuromuscular
- Peripheral nerve
- Pediatric neurosurgery
- Functional neurosurgery
- Cerebrovascular and endovascular
- Chart excludes fellows in spine (with orthopedics - Department of Surgery)



The Section of Neurology

Section Head: Dr. Luanne Metz

THE SECTION OF NEUROLOGY takes a population-based perspective to providing neurologic care to Southern Alberta and Southeastern British Columbia. In addition, patients from across the country may be seen for consultation in some of our very specialized clinics.

Vision:
To improve quality of life and daily function for our patients by reducing the burden of neurological disorders.

Mission:
To be an international leader in neurological patient care, education and research.

Sixty neurologists, including seven locums, participated in section activities in this fiscal year. Several innovations that impact the entire section were implemented.

A fellow-locum program that began in July 2015 has proven to be a win-win for patient care and participating fellows. Fellows who are Royal College certified may spend 10-20 per cent of their time doing general neurology clinics. This provides additional clinical service and allows fellows to develop practice experience in a well-supported environment while enhancing their income.

Late in 2015 we piloted the role of a neuro-hospitalist. This helped us determine how to implement the neuro-hospitalist role.

A procedure teaching clinic was initiated in late 2015. While concurrently providing a clinical service, residents from many programs gain experience performing spinal taps, doing cervical nerve blocks, and administering botulinum toxin for migraine.

Neurology is organized into several subspecialty programs. These programs include headache, neuromuscular, ALS, multiple sclerosis, neuroimmunology, movement disorders, epilepsy, general neurology, urgent neurology, neuro-ophthalmology, neuro-vestibular, stroke, and cognitive neurosciences. Section members also play important roles in Calgary's neuro-oncology and chronic pain programs and provide outreach

services to the Calgary Urban Project Society (CUPS) and 'The Alex' medical clinics.

Most neurologists are based at one of four hospital sites—Foothills Medical Centre (FMC), Peter Lougheed Centre (PLC), Rockyview General Hospital (RGH), and South Health Campus (SHC)—to support outpatient general neurology and sub-specialty clinics and neurophysiology labs. Most are funded through an Academic Alternative Relationship Plan (AARP).

The section operates as a cohesive unit to provide city-wide emergency and hospital services. One team provides general neurology support to all four adult acute care hospitals, including inpatient consultation services at the four sites and neurology inpatient ward services at FMC and SHC. A team of stroke neurologists provides acute stroke care at FMC and provides city-wide leadership in stroke management. A third service of epilepsy neurologists manages two inpatient seizure-monitoring units, provides extended hour city-wide EEG support, and provides 24-hour EEG support to city intensive care units.

Research

The Section of Neurology is well recognized for research productivity and the major clinical impact of its research endeavours. We continue to demonstrate that care can be improved through innovative research. The Alberta Health Services President's Excellence Award for Outstanding Achievements in Research was awarded to the ESCAPE Trial Team and the Calgary Stroke Program won the ASTech Award (Alberta Science and Technology Award) in the category of Society Impact. The team, led by neurologists Michael Hill and Andrew Demchuk, along with neuroradiologist Mayank Goyal, demonstrated that endovascular treatment can dramatically improve patient outcomes after acute ischemic stroke.

Our researchers include clinician scientists and population health investigators, who spend up to 80 per cent of their time undertaking research, as well as clinical researchers who spend 20-65 per cent of their time doing research. Neurologists continue to hold major research leadership positions within the University of Calgary. Sam Wiebe continued as Associate Dean of Clinical Research and Michael Hill completed several years as Associate Dean of Clinical Trials. Greg Cairncross continued as Director of the Arnie Charbonneau Cancer Institute.

Education

Excellence in education is highly valued in our section. Dedicated neurologists lead our residency program (Michael Yeung), the undergraduate neuroscience course (Gary Klein, David Patry, Jeptha Davenport), the neurology clerkship (David Patry), and continuing medical education (Justyna Sarna). Neurologists also lead our sub-specialty fellowship programs and hold important education leadership positions within the University of Calgary. Lara Cooke is Associate Dean of Continuing Medical Education and Kevin Busche is Assistant Dean of Undergraduate Education. Many others contribute to program leadership and everyone is involved in both didactic and bedside teaching.

Our residents were all successful in obtaining their Royal College certification in 2016 and all continued in fellowships or initiated careers in independent practice. We continue to have residents who are undertaking graduate degrees in medical education. This speaks to the positive examples provided by our neurologist educators and how seriously we take this role.

Neurology has several very popular subspecialty fellowship programs. In 2015-16 there were 10 fellows in stroke, four in multiple sclerosis/neuroimmunology, two in neuromuscular/EMG, and one each in epilepsy/EEG, cognitive neurology, and neuro-oncology.

Other Individual Highlights

- Luanne Metz was awarded the Alberta Medical Association Medal of Distinguished Service (Sept. 2015)
- Eric Smith was awarded a 2015 Killam Emerging Research Leader Award (Oct. 2015)
- Nathalie Jetté was awarded the Jones Award from the Cumming School of Medicine for Outstanding Contributions to Undergraduate Medical Education (2015)
- Lawrence Korngut was recognized by Avenue Magazine as one of the Top 40 Under 40 (Oct. 2015)
- Bijoy Menon won the Michael S. Pessin Stroke Leadership Prize from the American Academy of Neurology (Feb. 2016)
- Nathalie Jetté's CIHR Tier II Canada Research Chair in Neurological Health Services Research was renewed (Feb. 2016)
- Sam Wiebe became President-elect of the International League Against Epilepsy (May 2016)
- Dawn Pearson completed the Master Teacher training program (May 2016)
- Angela Russell (Nurse Practitioner at South Health Campus) received the 2015-16 Professional Association of Residents of Alberta (PARA) Multidisciplinary Team Member Award

There have also been changes to our team. This year we said goodbye to Ranjit Ranawaya who retired in December 2015 after 36 years of practising neurology in Calgary. He recently led our Movement Disorders Clinic. Werner Becker and Neelan Pillay also semi-retired but continued to provide outpatient care in headache and epilepsy respectively. We welcomed Colin Josephson, who joined us as a clinician scientist and has a research focus on population health aspects of epilepsy.

Nurse practitioners embrace ‘jack-of-all-trades’ role that connects them to patients

▲ **Nurse Practitioner Angela Russell is always collaborating at South Health Campus.**

NURSE PRACTITIONER ANGELA RUSSELL fittingly describes her role in Neurology at South Heath Campus (SHC) as “in-between”.

“We have the ability to prescribe just about anything in Alberta, similar to a physician,” she says, ”but we’re nurses and we’re not trained to be physicians. We complement the physician role. We bring something else to the table.”

That “something else” includes being a support and resource for patients and their families during their stay at SHC.

Physicians rotate shifts weekly, so Russell and her counterpart at Foothills Hospital, Jessica Jenkins, are a common face for patients.

“We’re the continuity through the service. Week to week to week, we’re always there. In Neurology, we have patients that often require lengthy admissions—sometimes weeks, sometimes months.”

The connection is invaluable to patients who are often facing difficult diagnoses and challenging paths forward.

“That’s even true in people who come in and out of hospital relatively frequently,” says Russell. “They feel comfortable with us. And, of course, we work as a team, always, with the physicians and provide quality care.”

Communications is also a strength that nurse practitioners bring to the table, says Jenkins, who joined Neurology in June 2016.

“We’re the continuity through the service. Week to week to week, we’re always there.”

— Angela Russell, Nurse Practitioner

“As a team, we care for a variety issues and circumstances that sometimes lend themselves to prolonged hospital stays for patients,” she says.

“As an NP, I hope that my presence ensures that information is passed on in a complete way to our own team in handover and between teams when consultants are involved.”

Russell credits physicians in the Department of Clinical Neurosciences for advocating for the nurse practitioner role before she joined the section five years ago.

“I know that the physicians paved the way and requested that our expertise be added to the care that’s provided. I think that’s a big reason why it’s been successful.”

She says some of their success is related to nurse practitioners’ knowledge of the system—and how to get things done quickly.

“That comes down to not only putting patients and families in contact with resources that are going to make their life easier outside of the hospital, but also expediting things like testing for them; making the right connections with people like radiology and physiotherapy and occupational therapy.”

The result can mean patients don’t have to stay in hospital longer than they should and, when they leave hospital, they have the supports to continue with their recovery at home.

When she’s not treating patients, leading quality improvement projects or driving policy and procedure changes, you’ll find Russell collaborating with neurology residents.

“We’re a team,” she says. “When I don’t know something, I go to them. And when they don’t know something, they come to me.”

Her collaboration led to Russell being nominated by the residents and winning an Interdisciplinary Teamwork Award from the Professional Association of Resident Physicians of Alberta (PARA).

“It was truly an honour to be recognized by such an exceptional group of physicians.”

The Section of Neurology is proud to have four Nurse Practitioners working with them: Colleen Harris, Jessica Jenkins, Nancy Newcommon and Angela Russell.

Lumbar puncture clinic streamlines access to diagnostic procedure

Residents receive unique learning opportunity

A NEW LUMBAR PUNCTURE (LP) CLINIC that began receiving patients in October 2015 is streamlining access to the procedure, freeing up neurologists for other clinical care, and providing an invaluable learning opportunity for residents.

The procedure, which is performed by inserting a hollow needle into the subarachnoid space in the lumbar spine, is often used to collect cerebrospinal fluid for examination and testing of neurological disorders.

Neurologist Dr. Ronak Kapadia, who runs the clinic along with Dr. Michael Yeung, says the service is receiving 10-15 referrals per month from both community and hospital based neurologists.

"Now, instead of worrying about fitting in their patients into their busy clinic schedules, and finding time, space and lumbar puncture kits, they can send their patient to the LP clinic and have it completed in one to three weeks."

Dr. Kapadia, says the clinic, which also has spots available each week for urgent cases, is seeing above average success rates.

"By having a standardized approach, and all the right equipment readily available, we have achieved a success rate of 97 per cent," he says. "This is higher than what is reported in the literature."

Patients, he says, know they are coming to a teaching clinic and appreciate that they are contributing to the training of residents and students.

"We have medical students, internal medicine residents, and both junior and senior neurology residents rotate through the LP clinic.

"There is no equivalent opportunity available for learning to perform LPs and the feedback from learners has been overwhelmingly positive."

▲ **Dr. Ronak Kapadia says the new clinic is receiving referrals from community and hospital-based neurologists.**

In fact, the educational benefits of the clinic are being studied by chief neurology resident Dr. Theo Mobach as part of his resident research project.

Above all, Dr. Kapadia credits RN Shannon Searle with keeping the clinic running smoothly.

"Shannon has been absolutely instrumental in the development and continuing success of the clinic," he says.

"Shannon helped us procure an ultrasound machine, works in booking and counseling of patients before their appointments, and makes sure the clinic runs smoothly each week by co-ordinating lab results, imaging results, and getting urgent patients booked into the clinic on short notice.

The Calgary Comprehensive Epilepsy Program

Program Lead: Dr. Samuel Wiebe

Overview

Through its strong academic and clinical arms, the Calgary Epilepsy Program (CEP) focuses on achieving the best outcomes for patients suffering from epilepsy. This is accomplished through new developments in clinical research, quality improvement initiatives, and comprehensive, interdisciplinary clinical care. The interdisciplinary team includes a highly skilled group of specialists in epilepsy comprising neurologist epileptologists, epilepsy neurosurgeons, neuropsychiatrists, clinical psychologists, neuropsychologists, neuroradiologists, nuclear medicine specialists, clinical assistant physicians, nurses, EEG technologists and clinical neurophysiologists.

Dr. Samuel Wiebe

The research team has strong collaborations with the Hotchkiss Brain Institute, The O'Brien Institute for Public Health, and the Alberta Children's Hospital Research Institute. The team includes basic scientists (HBI), health outcomes and health services researchers, and advanced imaging researchers.

As a tertiary care centre, the CEP provides care for a wide breadth of persons with epilepsy, including those with complex epilepsies, and those requiring complex surgical investigations and interventions for epilepsy. Complex and surgical cases are discussed weekly in our multidisciplinary conferences in conjunction with our Pediatric Epilepsy Colleagues.

Core clinical facilities available at the CEP include:

- State-of-the-art neurophysiologic assessment including long-term video-EEG monitoring, day-time video-EEG monitoring, 24-hour ambulatory EEG monitoring, intracranial EEG using multiple modalities of implantation and electrodes, functional brain mapping, and intraoperative monitoring and evoked potentials. Analysis of high frequency oscillations (HFOs) is available and automated detection of HFOs is being developed.
- Advanced functional imaging includes PET, SPECT, functional MRI with capacity for mapping of cortical function, voxel-based relaxometry and arterial spin labeling, as well as EEG-fMRI interictal and ictal studies.
- Led by Dr. Yahya Aghakani, the EEG laboratory operates at four hospital sites, and the Seizure Monitoring Unit operates at the Foothills Medical Centre and the South Health Campus simultaneously. Continuous video EEG monitoring is provided at all hospital sites for diagnostic purposes in hospitalized patients, and for seizure management in critically ill patients at all four adult sites in the Calgary Zone
- Neuropsychologists, clinical psychologists and neuropsychiatrists focusing on epilepsy provide care to patients in the CEP.
- Epilepsy surgery for drug-resistant epilepsy is guided by scalp and intracranial EEG. Surgical techniques include subdural and depth electrodes, stereo-EEG, cortical mapping, the entire breadth of procedures for cortical resection and disconnection, deep brain stimulation, and vagus nerve stimulation.

Research and Leadership

The CEP houses world-class research teams in health services research and outcomes research (Dr. Jetté, Dr. Wiebe and Dr. Josephson) and in advanced imaging in epilepsy (Dr. Federico). Members of the CEP serve in leadership positions of the Canadian League Against Epilepsy, the International League Against Epilepsy (ILAE), the North American Commission of the ILAE, as well as in other international neurological organizations.

CONTINUED ON PAGE 16

CONTINUED FROM PAGE 15

Quality of Care

The CEP has developed a thriving quality of care program that systematically evaluates clinical care and patient outcomes in the SMU and in the epilepsy clinics. Through collaborations with Alberta Health Services, linkage with administrative health data allows for broader analyses of health resource use and the impact of health care in epilepsy. This year, the CEP database moved towards producing patient-specific information services and dashboards, which will be gradually implemented in the clinic.

Highlights

- The CEP held a very successful 7th International Epilepsy Symposium in October 2016, focusing on "Autoimmunity and Inflammation in Epilepsy." In addition to our local speakers, the one-day symposium featured four renowned international researchers in the field including Dr. Stéphane Auvin (Paris), Dr. Jeffrey Britton (Mayo Clinic Rochester), Dr. Josep Dalmau (Barcelona) and Dr. Alon Friedman (Dalhousie University).
- The 2016 Mary Anne Lee Memorial lecturer in epilepsy was Dr. Josep Dalmau from the Universities of Pennsylvania and Barcelona, who spoke about "Anti-NMDA Receptor Encephalitis: Symptoms and Mechanisms of Disease". In addition, the CEP held its annual epilepsy research retreat, with presentations by trainees from the various clinical and basic science epilepsy research teams.
- Dr. Nathalie Jetté in 2015-2016 led the Hotchkiss Brain Institute Epilepsy NeuroTeam and Neuro-Research Clinics initiative. She is the Canada Research Chair in Neurological Health Services Research, President of the Canadian League Against Epilepsy, elected secretary of the International League Against Epilepsy North American Commission, chaired numerous international committees, published over 35 peer reviewed articles, and continues to lead a world-renowned health services research program.
- Dr. Paolo Federico leads a world-class team which uses fMRI techniques to solve problems of complex epileptogenesis in patients. He leads the way in intracranial EEG-FMRI recordings, and is now implementing Arterial Spin Labeling MRI, and automated High Frequency Oscillation detection algorithms to identify the seizure focus. He serves in international committees for diagnostic studies in epilepsy and continues to be highly productive academically.
- Dr. Walter Hader implemented robotic implantation of intracranial EEG electrodes in children and adults using the Rosa System, acquired through a donation from Bob and Brenda McNeil.
- Dr. Sophia Macrodimitris and Dr. Ruby Sharma run a successful cognitive behavioural therapy program for epilepsy patients with anxiety and depression, a unique offering of the CEP. They also continue to supervise students and collaborate in peer reviewed publications, and they contribute substantially to the Quality Improvement program in the Seizure Monitoring Unit. Dr. Lisa Partlo and Dr. Kim Goddard have standardized procedures for neuropsychological testing in epilepsy patients across hospitals, providing a uniquely strong team for our CEP. Dr. Brianne McLean joined the CEP team as our second neuropsychiatrist, with Dr. Aaron Mackie.
- Our Pediatric Epilepsy colleagues have made great progress in clinical informatics. Dr. Jeff Buchhalter implemented outcomes-oriented structured epilepsy notes in the SCM electronic health record, with over 1,000 unique patients already entered and clinical dashboards re-calculated every 24 hours. The neuro-metabolic program has been re-designed using efficient, patient-parent centric care pathway.
- This year we graduated one Canadian (Dr. Colin Josephson) and two international epilepsy fellows (Dr. Shaily Singh and Dr. Sherry Sandy), who also became certified in EEG by the Canadian Society of Clinical Neurophysiology. The CEP also hosted four international clinical observers, and held over 40 educational sessions on EEG and epilepsy-related topics.
- Dr. Colin Josephson will be recruited this year to establish a research program examining novel approaches to clinical prediction and outcomes research. His primary interest is in the application of novel analytical techniques to 'Big Data' derived from a variety of sources, including cohort studies, electronic health records and administrative health data. He is currently examining somatic and psychiatric co-morbidities, pharmacoepidemiology, and predictors of seizure-free outcomes in epilepsy. Ultimately, his aim is to use novel machine learning techniques to develop precision medicine models that will be applied for clinical decision-making at the point of care. Dr. Shaily Singh will be recruited later this year as a major clinical epilepsy neurologist with expertise in cortical clinical electrophysiology, clinical epilepsy, and presurgical evaluation. She will also take on important collaborative roles in clinical research, education, and clinical data management.
- With Dr. Neelan Pillay's retirement, Dr. Wiebe assumed the leadership of the CEP. Dr. Yahya Aghakani took on the directorship of the EEG laboratories. Dr. Paolo Federico assumed the directorship of Education and Fellowships. Dr. Jetté lead quality improvement, seizure monitoring units and epilepsy clinics, and she leads the Neuro-Research initiative. Dr. William Murphy overviews clinical assistants and clinical trials.
- Dr. Wiebe continues to serve as Associate Dean of Clinical Research, chair of the Clinical Research Unit for the Cumming School of Medicine, and serves on the Executive Board of the International League Against Epilepsy. This year he was elected as incoming president of the International League Against Epilepsy. Dr. Wiebe continues to focus on outcomes and health services research.

Members

Epileptologists: Dr. Yahya Agha-Khani, Dr. Alexandra Hanson, Dr. Paolo Federico, Dr. Nathalie Jetté, Dr. Brian Klassen, Dr. William Murphy, Dr. Neelan Pillay, Dr. Samuel Wiebe

Neurosurgeons: Dr. Walter Hader, Dr. Yves Starreveld

Neuropsychiatrists: Dr. Aaron Mackie, Dr. Brianne McLean

Clinical psychologists: Dr. Sophia Macrodimitris, Dr. Ruby Sharma

Neuropsychologists: Dr. Lisa Partlo, Dr. Kim Goddard

Neuroradiology: Dr. James Scott

Nuclear Medicine: Dr. Christine Molnar, Dr. Leonard Numerow

Clinical Assistants: Dr. Reynaldo Avendano, Dr. Salma Hanna

Epilepsy Fellows (July 2015 to June 2016): Dr. Colin Josephson, Dr. Shaily Singh, Dr. Sherry Sandy

Epilepsy Nurses: Jackie Martini, Michele Zulinick, Meliza Camerino, Amira Jivraj

The Calgary Stroke Program

Program Lead: Dr. Andrew Demchuk

Overview

The Calgary Stroke Program (CSP), a collaboration between the University of Calgary and Alberta Health Services, continues to grow and contribute to the field of stroke care. Our program figured prominently nationally and internationally on a number of fronts this past fiscal year.

Dr. Andrew Demchuk

Highlights

- One extraordinary program achievement was the leadership role in developing the HERMES collaboration. The collaboration successful brought together all seven predominantly stent retriever-based randomized clinical trials of mechanical thrombectomy in stroke. This HERMES collaboration has been led by Dr. Mayank Goyal and has already resulted in two high-impact major publications in the Lancet and JAMA. The Lancet publication (M. Goyal, B. Menon co-first authors) is a patient level pooled analysis of over 1,200 randomized subjects and describes differences in treatment effect amongst several important subgroups. The JAMA publication (M. Hill senior author) was the time analysis of pooled data from all trials which has demonstrated the time window for efficacy for mechanical thrombectomy is actually 7.3 hours (onset to groin puncture). This analysis also demonstrated the urgency required for this therapy, with each 15 minutes saved resulting in two out of 100 subjects having less disability.
- The Calgary Stroke Program Neuroimaging Core Lab is the largest of its kind in the world, housing neuroimaging data from more than 10,000 research participants in epidemiological studies and clinical trials for stroke, including the HERMES registry data and many others. Data from more than 1,000 new participants are added each year. This is the world's richest collection of stroke neuroimaging information.
- The QuICR Alberta Stroke Program is an Alberta Innovates CRIO grant. It is a provincial program led by Drs. Hill, Demchuk and (from Edmonton) Drs. Jeerakathil and Shuaib. The quality improvement section of the program, led by Dr. Noreen Kamal has focused on acute stroke treatment. We aim to achieve a 30-minute median door-to-needle time for all stroke patients treated in the province. Our interim target of 45 minutes has been achieved in 2015 and we are working hard to achieve a 30-minute median in 2016. Currently, the provincial average hovers at approximately 35 minutes from stroke onset. This remarkable provincial achievement has resulted from the collaboration between the QuICR group and the Stroke and Cardiovascular Health Strategic Clinical Network of AHS.
- Dr. Andrew Demchuk leads implementation of the "CaSTOR Canadian Stroke Trials for Optimized Results" National Stroke Clinical Trials Network in Canada. This $1.5 million Institute of Circulatory and Respiratory Health (ICRH) emerging networks grant (2015-2020) is a collaboration with the Canadian Stroke Consortium and Canadian Partners for Stroke Recovery. Several national initiatives are now underway to boost Canadian-led stroke clinical trial activity in Canada through CaSTOR.
- Dr. Shelagh Coutts (PI) is currently ramping up the Tenecteplase (2nd generation tPA) to use in a planned randomized clinical trial of IV thrombolysis in mild stroke patients with an intracranial occlusion (TEMPO-2). There are planned sites in multiple countries and over 50 patients have been enrolled to date.
- Dr. Michael Hill (PI) is in the early stages of initiation of the ESCAPE NA-1 trial, which is collaboration between University of Calgary/ Calgary Stroke Program and NoNO Inc. (Toronto) to study a novel neuroprotectant (NA-1) in patients undergoing endovascular treatment for acute stroke. This is a very large 1,100 patient pivotal Phase 3 trial that will be led in Calgary and run at multiple countries worldwide.
- Dr. Bijoy Menon is expanding the acute stroke imaging research group in collaboration with the departments of engineering, imaging sciences and community health sciences. The acute stroke imaging group now has more than 25 team members, including postdocs, research fellows, master's students, clinical fellows, residents and medical students. The number of international imaging research fellows has increased significantly over the last year and now includes fellows from Switzerland, Netherlands, South Korea and Saudi Arabia. The program has recruited an imaging scientist this year (Dr. Qiu) and was successful in receiving funding from the University of Calgary towards recruiting an Eyes High Post Doc Fellow (Dr. Kuang, Hong Kong). The program was the Core Lab for all CTA reads for the HERMES collaboration (n=1,600). The program successfully completed the INTERRSeCT (n=600) and PRoveIT (n=600) multi-centre imaging trials.
- Dr. Eric Smith received the Cochrane Award for Research from the University of Calgary, and was elected to the College of New Scholars, Artists and Scientists of the Royal Society of Canada. Dr. Smith's new Brain Canada and CIHR-funded research will investigate biomarkers of vascular beta-amyloid in patients with cerebral amyloid angiopathy and Alzheimer's disease.
- Dr. Phil Barber was successful at the fall 2015 HSFC grant-in-aid competition for the grant entitled: "Predementia Neuroimaging of Transient Ischemic Attack (TIA) – PREVENT Study". He will receive $293,000 over three years.
- Dr. Suresh Subramaniam was appointed as the site lead for the Section of Neurology at South Health Campus.
- Dr. Bijoy Menon received the Michael S. Pessin Stroke Leadership Award from the American Academy of Neurology and the PEAK Scholar Award in Entrepreneurship, Innovation and Knowledge Translation from the University of Calgary. He also received a CIHR project grant and an HSFC Grant-In-Aid (declined) this year.
- Both Dr. Hill and Dr. Demchuk joined the 10K Citation Club of scientists at the Cumming School of Medicine—researchers who have been cited more than 10,000 times during their careers.
- The Calgary Stroke Program was the successful recipient of the 2015 ASTech Foundation Societal Impact Award.
- The ESCAPE Trial Team received a President's Excellence Award for Outstanding Achievement in Research 2016 from Alberta Health Services.

Education

As of June this year, our program has trained and graduated 69 stroke fellows, from 15 countries, including Canada. Last year, we trained eight fellows, including three Canadians. In addition, we have seen a major increase in applications to our fellowships, with two to three applicants per month. Dr. Simer Bal has joined the fellowship training leadership team.

Research

Research is the core of the CSP. Significant progress has been made over the last year to further establish the CSP as a leader in stroke clinical trials and an internationally respected clinical research program and imaging core lab facility for large stroke trials. The collective H-index of the clinician scientists within the program now exceeds 80 (Google Scholar).

Members

Stroke Neurology: Dr. Simer Bal, Dr. Phil Barber, Dr. Philippe Couillard, Dr. Shelagh Coutts, Dr. Andrew Demchuk, Dr. Michael Hill, Dr. Adam Kirton (Pediatrics), Dr. Gary Klein, Dr. Bijoy Menon, Dr. Alekys Mineyko (Pediatrics), Dr. Dawn Pearson, Dr. Eric Smith, Dr. Peter Stys, Dr. Suresh Subramaniam, Dr. Tim Watson

Stroke Physical Medicine and Rehabilitation: Dr. Sean Dukelow, Dr. Ken Lam, Dr. Gentson Leung, Dr. Steve McNeil

Vascular Neurosurgery: Dr. Alim Mitha, Dr. Garnette Sutherland, Dr. John Wong

Interventional Neuroradiology: Dr. Muneer Eesa, Dr. Mayank Goyal, Dr. Will Morrish

Nursing: Nancy Newcommon

Stroke Program Manager: Shelly Bohn

The Cognitive Neurosciences Program

Program Lead: Dr. Eric Smith

Overview

The Cognitive Neurosciences Program provides expert medical consultation for cognitive disorders, educates undergraduate and postgraduate learners, and conducts research on the causes, medical evaluation and treatment of cognitive disorders and dementia.

Program members include neurologists, psychiatrists, nurses, neuropsychologists, research staff, and Allied Health professionals at the Foothills Medical Centre and South Health Campus sites. There are five neurologists (Eric Smith, David Patry, Dawn Pearson, Bijoy Menon and Philip Barber) and four psychiatrists (Jeremy Quickfall, Zahinoor Ismail, Aaron Mackie and Robert Granger) who see patients in the clinic.

Highlights

Dr. Zahinoor Ismail led an Alzheimer's Association Professional Interest Area writing committee which produced the first consensus diagnostic criteria for Mild Behavioural Impairment, an increasingly recognized clinical entity that can precede neurodegeneration and dementia. The criteria were recently published in the journal Alzheimer's & Dementia. Dr. Ismail also led the group of international collaborators in development of the Mild Behavioural Impairment checklist (MBI-C), an instrument based on the MBI criteria, for the purpose of MBI case detection and dementia prognostication. The MBI-C was presented at the Alzheimer's Association International Conference and garnered extensive media attention with articles and appearances in The New York Times, Washington Post, London Daily Mail, Yahoo News, CBC, Global and CTV. The MBI-C has since been translated into 12 languages and is in use as a clinical and research instrument in the Cognitive Neuroscience Clinic.

Education

Dr. Alicja Cieslak joined the program in July 2015 and is now completing her second year of fellowship. Additionally, the Cognitive Neurosciences Clinic provides training experiences for residents from various disciplines—including neurology, psychiatry and geriatric medicine—as well as medical students.

Research

Dr. Eric Smith co-leads the Dementia and Cognitive Disorders NeuroTeam of the Brain and Mental Health Strategy of the University of Calgary, along with Dr. Lorraine Venturato. The NeuroTeam brings together University of Calgary researchers in cognitive aging and dementia, across all faculties and pillars of research, to promote inter-disciplinary collaboration and team grant applications.

Canada's national research network for dementia, the Canadian Consortium on Neurodegeneration and Aging, was created in 2014. Dr. Smith leads the Vascular Illness team within the consortium, and Dr. Ismail is a member of the Vascular Illness team and the Neuropsychiatry team. An observational longitudinal cohort study of patients with mild cognitive impairment and dementia, called COMPASS-ND, is beginning.

The vascular dementia research program is supported by the University of Calgary Katthy Taylor Chair in Vascular Dementia, held by Dr. Smith. In 2016, Brain Canada awarded a multi-investigator research initiative (MIRI) grant to a team of Alberta investigators led by Dr. Smith to study cerebral amyloid angiopathy and Alzheimer's disease.

There is an active program in pharmaceutical company-sponsored clinical trials, led by Dr. David Patry. In the last year, patients with Alzheimer's disease, mild cognitive impairment, and frontotemporal dementia participated in these trials.

Members

Neurology: Dr. Eric Smith, Dr. David Patry, Dr. Dawn Pearson, Dr. Bijoy Menon, Dr. Philip Barber

Psychiatry: Dr. Jeremy Quickfall, Dr. Zahinoor Ismail, Dr. Aaron Mackie, Dr. Robert Granger

Neuropsychology: Dr. Catherine Burton, Dr. Kim Goddard

The General Neurology Program

Program Lead: Dr. Katie Wiltshire

Overview

Dr. Katie Wiltshire

The General Neurology Program involves many of the members of the Section of Neurology. These members provide outpatient clinical services to patients at each of the four adult hospital sites and in the community.

Highlights

Over the past several years the General Neurology program in Calgary has implemented many innovations in care delivery and system processes. We have worked to develop a Central Access and Triage (CAT) system for general neurology. Given its success, CAT will be rolled out to involve all specialties within neurology (with the exception Stroke and Urgent Neurology) to simplify the referral process.

Additionally, we have worked with the Primary Care Network to be able to provide a telephone consult service, Specialist Link, which provides timely telephone advice for referring physicians who have general neurology questions about their patients.

Additional innovations in care have been implemented to help improve quality of care and access, including increased usage of multidisciplinary services for general neurology patients and an active locum general neurologist program.

Education

Residents, clerks and medical students commonly spend time in the general neurology clinics.

Members

Dr. Katie Wiltshire, Dr. Brian Klassen, Dr. Jodie Burton, Dr. Ronak Kapadia, Dr. Alex Hanson, Dr. Michael Hill, Dr. Phil Barber, Dr. Lara Cooke, Dr. Kevin Busche, Dr. Jeptha Davenport, Dr. Sam Chhibber, Dr. Katie Wiltshire, Dr. David Patry, Dr. Farnaz Amoozegar, Dr. Dawn Pearson, Dr. Gary Klein, Dr. William Murphy, Dr. Scott Wilson, Dr. Jagdeep Kohli, Dr. Hamid Ebadi, Dr. Simer Bal, Dr. Scott Jarvis, Dr. Suresh Subramaniam, Dr. William Murphy, Dr. Scott Wilson, Dr. Jagdeep Kohli, Dr. Yanjun Duan, Dr. Shaily Singh

The Headache Program

Program Lead: Dr. Jeptha Davenport

Overview

The Headache Program is a collaboration between DCNS and the Calgary Pain Program. The program has two clinics within Calgary: the Calgary Headache Assessment & Management Program (at the South Health Campus) and the Headache Group of the Chronic Pain Centre (at the Richmond Road Diagnostic & Treatment Centre).

Highlights

The Headache Program follows a patient-centred, team approach with interdisciplinary collaboration. In total, the program receives over 2,000 patient referrals per year and we provide access to a greater number of patients each year. The program offers: group education sessions, telephone consultations with referring physicians and patients, and telehealth visits for patients living outside of Calgary.

Education

We provide training to: Headache fellows from Canada and abroad, residents in anesthesiology and family practice and medical students across Canada. The Headache Program also emphasizes the role of patient and family education in coping with headache disorders, many of which are chronic diseases with episodic manifestations.

Headache program members have participated at the national level in the Canadian Headache Society National Neurology Residents Headache Course held in Montreal each October; in the headache courses held at the Canadian Neurological Sciences Federation meeting each June; and at the Launch Resident Teaching Course in Toronto each February.

Research

The Headache Program is invested in clinical research which includes a Phase 2 medication trial, an exercise trial, a bridging preventive medication trial, and a new electronic diary application. Program members have also been active in publishing guidelines and other articles on headache diagnosis and treatment.

DCNS Members

Dr. Farnaz Amoozegar
Dr. Lara Cooke
Dr. Jeptha Davenport
Dr. Arnolda Eloff

Physicians

Neurologist: Dr. Prin Chitsantikul
Neuropsychiatrist: Dr. Aaron Mackie
Family physician: Dr. Lori Montgomery
Psychiatrist support services: Dr. Sam Oluwadairo, Dr. Stephen Amadala, Dr. Pamella Manning

Nurses

Irene O'Callaghan, Rachelle Ellis, Nora Lee, Lillian Lowry, Helene Kiriakopoulos, Debbie Hartlieb

Allied Health

Occupational therapists: Kathryn Coutts, Allison McLean, Angie Yang
Physiotherapists: Kate Gerry, Philis Heffner
Psychologists: Dr. Penny Ford, Dr. Sharon Habermann, Mr. Joel Roos
Pharmacist: Joyce Côté
Kinesiologist: François Gagnon
Dietitian: Kelly Sullivan

Administration Support

Leatha Semrick, Lydia Gallo, Lisa LeBlanc, Kate Walker, Deb Nicholson, Krista Hansen, Kristen Haakenstad, Connie Burkart, Suzanne Basiuk, Carolyn Baldwin

The Movement Disorder Program

Acting Program Lead: Dr. Justyna Sarna

Overview

The Movement Disorders Program at the University of Calgary is a multi-disciplinary team comprised of neurologists, psychiatrists, a psychologist, a neurosurgeon and basic scientists. The clinical team provides treatment for a variety of movement disorders including Parkinson's disease, essential tremor, Huntington's disease, Tourette syndrome, drug-induced movement disorders, ataxia and dystonia. The clinical program holds the designation of Center of Excellence through the National Parkinson Foundation (NPF).

Highlights

The first Calgary Movement Disorders Symposium was held in September 2015 and included:

- Dr. Anthony Lang – University of Toronto
- Dr. Joseph Jankovic – Baylor College of Medicine, Houston, Texas
- Dr. Alberto Espay – University of Cincinnati, Ohio
- Case presentations from local neurologists

The clinical program is subdivided into the following subspecialty clinics:

- Botulinum toxin clinics for the treatment of dystonia and hemifacial spasm
- General Movement Disorders clinics – primary focus being treatment of Parkinson's disease
- Multidisciplinary Huntington's disease clinics – comprehensive management of Huntington's disease through collaborative care by neurology, psychiatry, nursing and social work
- Drug-induced movement disorder clinic
- Deep brain stimulation assessments for a variety of movement disorders including essential tremor, Parkinson's disease and dystonia among others
- Duodopa program for the advanced treatment of Parkinson's disease

The Movement Disorders Program has started building a research registry and database that will benefit the members of the Movement Disorders NeuroTeam and facilitate collaborations with other centres provincially, nationally and internationally. This is part of a larger initiative named the Calgary Parkinson's Research Initiative (CaPRI).

- Two large scale studies led by the Tourmaline Oil Chair in Parkinson's disease (Dr. Oury Monchi) involving various researchers and clinicians of the Movement Disorders NeuroTeam are under way:
  - An observational longitudinal study that aims to identify biomarkers (including neuroimaging, clinical, genetic and other molecular ones) that are predictive of dementia in Parkinson's disease and compare cognitive decline in PD with mild cognitive impairment found at the prodromal stages of other neurodegenerative diseases such as Alzheimer's disease.
  - An interventional study about the effect of multiple sessions of high frequency TMS (theta-burst stimulation) on the cognitive deficits in PD-MCI, and associated patterns of functional activity and connectivity as observed with task-based and resting-state fMRI.
- Dr. Bin Hu continues to work on the Ambulosono program. The trial now encompasses other national and international sites.
- Participation in other multi-centre clinical trials includes:
  - Steady PD3 trial investigating efficacy of isradipine as a disease-modifying agent in early Parkinson's disease.
  - Global phase 3 trial of istradefylline in moderate to advanced Parkinson's disease for the treatment of wearing off phenomena.
  - Observational study of Huntington's disease (ENROLL-HD trial)

Dr. Ranjit Ranawaya, who led the Movement Disorders Program over the last several years, retired in December 2015. The clinic has welcomed Eric Tse as a dedicated nurse for the Duodopa program.

Members

Neurologists: Dr. Sarah Furtado, Dr. Scott Kraft, Dr. Tamara Pringsheim, Dr. Ranjit Ranawaya (retired Dec. 31, 2015), Dr. Justyna Sarna
Psychiatrists: Dr. Jeremy Quickfall, Dr. Aaron Mackie, Dr. Brienne McLane
Neurosurgeon: Dr. Zelma Kiss
Psychologist: Dr. Angela Haffenden
Researchers: Dr. Bin Hu, Dr. Oury Monchi
Nurses: Karen Hunka, Nancy Labelle, Meliza Camerino, Pia Lawrence, Carol Pantella, Eric Tse
Research Co-ordinator: Lorelei Tainsh
Administrative Staff: Bonita Woytowich, Hanna Mogos, Lydia Poulin, Janis Querido

The Multiple Sclerosis (MS) Program, MS and Neuroimmunology Clinics

MS Program Lead: Dr. Luanne Metz

Neuroimmunology Lead: Dr. Katayoun Alikhani

Overview

Dr. Luanne Metz

The Multiple Sclerosis (MS) Program provides multidisciplinary, population-based care to people with MS and other Central Nervous System (CNS) demyelinating disorders living in southern Alberta and southeastern British Columbia.

The services provided by our specialized clinical team, based on a chronic disease management approach, include: medical, nursing, rehabilitation and counseling. Our goal is to prevent or lessen disability and optimize wellness. Our team also provides leadership in care delivery and regularly provides advice regarding policies related to MS care.

The Neuroimmunology Clinic provides multidisciplinary care to patients with various neuro-inflammatory disorders, including neurosarcoidosis, vasculitis, and other systemic immune-mediated disorders affecting the nervous system.

Education

The MS program supports the education of trainees at all levels. Neurology residents do MS Clinic rotations in their junior and senior years. MS Fellows are involved in care and research. The MS program is well recognized for its research strengths. In association with the Hotchkiss Brain Institute, research includes: translational research, clinical and epidemiological research, basic science, innovations in imaging and trial design and clinical trials.

Members

Physicians: Katayoun Alikhani, Nadeem Bhanji, Jodie Burton, Kevin Busche, Chris Hahn, Marcus Koch, Scott Jarvis, Dan McGowan, Aaron Mackie, Luanne Metz, William Murphy, Scott Patten, David Patry, Michael Yeung.

Basic and Imaging Scientists: Jeff Dunn, Shalina Ousman, Bruce Pike, Peter Stys, V. Wee Yong, Yunyan Zhang

The Neuro-Ophthalmology and Neurovestibular Programs

Program Lead (Neuro-Ophthalmology): Dr. William Fletcher

Program Lead (Neurovestibular): Dr. Suresh Subramaniam

Overview

Dr. William Fletcher

Dr. Suresh Subramaniam

The Neuro-Ophthalmology Program, located at the Rockyview General Hospital Eye Clinic, focuses on disorders of vision and eye movement caused by neurological diseases such as multiple sclerosis, brain tumour and stroke. The Neurovestibular Program, located at South Health Campus, focuses on vertigo and dizziness. Both programs provide state-of-the-art diagnosis and treatment, including laboratory testing and physical and occupational therapy.

Highlights

In the current year, there were over 2,600 patient visits to the Neuro-Ophthalmology and Neurovestibular Clinics. Most patients seen in the Neuro-Ophthalmology Clinic are referred by specialists in ophthalmology, neurology or neurosurgery. The Neurovestibular Program also tested over 1,000 patients in the vestibular laboratory and provided over 1,100 vestibular physiotherapy visits.

Education

The Neuro-ophthalmology Program trains specialty residents learning to be neurologists or ophthalmologists. The Neurovestibular Program trains neurology and otolaryngology residents. Both programs hold regular educational rounds, provide learner evaluations, and teach medical students and Allied Health staff. Graduates of the Neuro-ophthalmology Fellowship Program include Dr. Elena Sokolova and Dr. Suresh Subramaniam.

Research

Research projects in Neuro-Ophthalmology include studies of the rehabilitation of homonymous hemianopia, the roles of hormones, vitamin D and novel therapies in optic neuritis, structural changes related to pituitary tumours, pregnancy and cardiovascular health, and the role of optical coherence tomography in monitoring patients with multiple sclerosis or tumours affecting the optic nerves or chiasm. Projects in the Neurovestibular Program include the study of a prototype rotary chair in the diagnosis of vestibular dysfunction and the role of physiotherapy in vestibular migraine.

Members

Medical Staff

- Dr. William Fletcher
- Dr. Fiona Costello
- Dr. Suresh Subramaniam
- Dr. Beth Lange (Otolaryngology)
- Dr. Euna Huang (Otolaryngology)

Neuro-Ophthalmology Program

- Kimberley Ade
- Sarah Keeler

Neurovestibular Program

- Melanie Oszust
- Gina Quinn
- Michelle Pushka
- Dominique Le Blanc
- Veronique St. Georges
- Craig Mulroney

The Neuromuscular Program

Acting Program Lead: Dr. Chris White

Overview

The Department of Clinical Neurosciences Neuromuscular Program provides health care services for people with disorders of the peripheral nervous system. The neuromuscular program clinical activity has consolidated at the South health campus. All outpatient clinical activities are provided at the site. The South Health Campus provides a unique opportunity to provide patient centred multidisciplinary care. The program includes the following clinics:

Dr. Chris White

Neuromuscular Clinic

For people with disease of nerve, neuromuscular junction and muscle. Examples include Guillain-Barré syndrome, myasthenia gravis, and inclusion body myositis

Neuromuscular rehabilitation clinic

A clinic that focuses on improving function in people with neuromuscular disease.

Motor neuron/ALS Clinic

For people with amyotrophic lateral sclerosis and related motor neuron diseases

Peripheral Nerve Clinic

A clinic to serve people with nerve injuries or disorders that may benefit from surgical intervention

Electromyography Clinics

Diagnostic clinics for those with disorders of the peripheral nervous system

All of the above clinics are multi-disciplinary. Depending on clinic needs patients may see multiple physicians (neurologist, physiatrist, respirologist, palliative care doctor, plastic surgeon, neurosurgeon), nurses, Allied Health care providers (physiotherapist, occupational therapist, speech and language pathologist, dietitian, social worker, neuropsychologist, respiratory therapist) or EMG technologist.

The Neuromuscular Research Program is headed by Dr. Lawrence Korngut. His outstanding work in developing national registries has led to his recognition as an international force in the area. The program is very excited to welcome Dr. Gerald Pfeffer. Dr. Pfeffer has special interest and expertise in genetics and inherited diseases of the peripheral nervous system. We look forward to him developing our clinical and research capabilities in neuromuscular genetics.

The Neuromuscular Education Program is headed by Dr. Sam Chhibber. The program provides education in neuromuscular disease diagnosis and management including EMG. The outstanding performance of our trainees is a testament to the training program. This year, we say goodbye to Dr. Nicholas Earle (Chile) and Dr. Amanda Fiander (PEI) and welcome neurologists Peter Dobrowolski (Edmonton) and Christine Stables(Vancouver).

Members

Dr. Chris White, Dr. Lawrence Korngut, Dr. Sameer Chhibber, Dr. Tom Feasby, Dr. Stephanie Plamondon and Dr. Hamid Ebadi, Dr. Gerald Pfeffer

Clinic Nurses
Dana Tigner, Christine Roberts, Susan Munro, Kris Jagt

Fellows
Dr. Christine Stables (Vancouver), Dr. Peter Dobrowolski (Edmonton)

Allied Health
Katty Oishi PT, Monic Brunet OT, Crystal Collinge SLP, Ashley Dalton PT, Dr. Kim Goddard Neuropsychology, Sandy Jensen DH, Shannon Josey RD, Gina Kroetsch OT, Leon Mitchell SW, Ray Tye RT, Crystal Collinge SLP

Clinical Research Co-ordinators:
Janet Petrillo, Jose Martinez

The Neuro-Oncology Program

Program Lead: Dr. Paula de Robles

Overview

The Neuro-Oncology Program focuses in the diagnosis, treatment and followup of patients with primary central nervous system tumours, neurological complications of cancer, and neurological paraneoplastic syndromes. We are a multidisciplinary program that works closely with the Surgical Neuro-Oncology, Neuropathology, and Palliative Care programs.

Dr. Paula de Robles

The majority of referrals are seen within 14 days. Most cases are reviewed in our weekly Neuro-Oncology multidisciplinary rounds which include the participation of Neuro-Oncology, Radiation Oncology, Neuroradiology, Neurosurgery, Neurology, Neuropathology, Pharmacy, Psychosocial services, Nursing, research staff, and trainees. Brain tumour patients are then seen in a multidisciplinary clinic.

Education

The Neuro-Oncology Program trains medical oncology, radiation oncology, internal medicine, and neurology residents. We also provide fellowship training in neuro-oncology.

Research

Our brain tumour patients are offered participation in multiple investigator-initiated and multi-centre clinical trials.

Trainees have the opportunity to gain wet lab experience in the Clark Smith Brain Tumour Centre in the Charbonneau Cancer Institute at the University of Calgary.

Members

Neuro-Oncologists:
Dr. Roger Tsang, Dr. Gloria Roldan Urgoiti, Dr. Gregory Cairncross, Dr. Paula de Robles

Radiation Oncologists:
Dr. Gerald Lim, Dr. Robert Nordal, Dr. Shaun Loewen

Neurologist:
Dr. Alexandra Hanson

Neurosurgeons:
Dr. Mark Hamilton, Dr. John Kelly, Dr. Yves Starreveld

Neuro-Oncology Fellow:
Dr. Wajid Sayeed

Clinical Psychologist:
Dr. Guy Pelletrier

Nurses:
Jill Bullock, Crystal Tellet, Cindy Yorke, Sally Lim, Ginny Holm, Diane Jahraus

Nurse Practitioner:
Catriona Leckie

Research Nurses:
Barbara Gawley, Luanne Crawford

Pharmacist:
Frances Cusano

Clinical Trial Co-ordinator:
Mailin Deane

The Tourette Syndrome and Pediatric Movement Disorders Program

Program Lead: Dr. Tamara Pringsheim

Overview

The Tourette Syndrome and Pediatric Movement Disorders Clinic provides consultation and continuing care for children and adults with Tourette syndrome and children with movement disorders such as dystonia, tremor, cerebral palsy and complex motor stereotypies.

Dr. Tamara Pringsheim

In December 2016, we will welcome Dr. Davide Martino to our clinic from King's College Hospital, London, UK.

Dr. Martino is an internationally recognized expert in Tourette syndrome, and we are delighted to have him join us. We would also like to thank pediatric neurologist Dr. Colleen Curtis for seeing children at the clinic during Dr. Pringsheim's sabbatical leave.

Research

Research at the clinic is focused on:

- improving antipsychotic safety monitoring in children
- promoting rational pharmacotherapy in children with neurodevelopmental and disruptive behaviour disorders
- knowledge synthesis and translation
- exploring novel therapeutic strategies for tics

Thanks to the generosity of the Owerko Family and the Owerko Centre on Neurodevelopment and Child Mental Health, we received funding to support clinical research activities at the Tourette Syndrome and Pediatric Movement Disorders Clinic. With this support, we are launching several new research initiatives, including a study of the effects of sleep, physical activity and diet on tic severity, and a study of longitudinal outcomes in children with tics. We are also developing a Tic Disorders Clinical Registry in collaboration with the Neurology and Mental Health Research Clinic. In addition to these new projects, our work on antipsychotic safety in children and transcranial magnetic stimulation as a new therapeutic strategy for tics continue.

Education

We provide training to medical students, residents in pediatrics, neurology and psychiatry, as well as fellows in movement disorders.

Residents in neurology spend time in the clinic as a part of their movement disorders rotation. Residents from other disciplines also take part in the clinic on an elective basis.

Members

Neurologists:
Dr. Justyna Sarna
Dr. Tamara Pringsheim

Nursing:
Tracy Hammer

Research Co-ordinator:
Sydney Osland

The Urgent Neurology Clinic

Program Lead: Dr. Alexandra Hanson

Overview

The Urgent Neurology Clinic is an outpatient clinic for adults requiring an urgent neurological consultation. Our mandate is to see patients within three to seven days from the time we received the referral. Further investigations are expedited so they can be completed in a timely manner. The Urgent Neurology Clinic is a single program with clinics held at both the Foothills Medical Centre and South Health Campus.

Dr. Alexandra Hanson

Highlights

For the calendar year 2015, 619 clinics were held (FMC 319, SHC 228). A total of 1,598 new patients were seen between the two sites (FMC 1,119, SHC 479), with eighty-two per cent of these seen within one week.

The Urgent Neurology Clinic works in conjunction with Neurology Central Access and Triage to ensure all patients are seen in the appropriate clinic.

The Urgent Neurology Clinic is an excellent venue for resident teaching and STACERs.

Members

Physicians

FMC: Dr. J. Burton, Dr. Y. Duan, Dr. P. de Robles, Dr. T. Feasby, Dr. S. Furtado, Dr. A. Hanson, Dr. J. Kohli, Dr. I. Polikov, Dr. J. Sarna, Dr. T. Watson, Dr. M. Yeung.

SHC: Dr. F. Amoozegar, Dr. T. Brust, Dr. R. Kapadia, Dr. W. Murphy, Dr. D. Patry, Dr. D. Pearson, Dr. K. Wiltshire, Dr. C. White.

Nurses: J. McNamara (FMC); L. Sorge (SHC)

Clerks: FMC: D. Gyonyor, H. Mogos, C. Sanchez, C. Wall; SHC: E. Morasch, C. Polehoyki

Department of Clinical Neurosciences 2015-2016

Pediatric Neurosciences

Dr. Jong M. Rho

THE SECTION OF PEDIATRIC NEUROLOGY based at the Alberta Children's Hospital (ACH) provides comprehensive neurological care to infants and children from Southern Alberta and neighbouring Saskatchewan/British Columbia.

Over a dozen faculty child neurologists and an extensive team of trainees and Allied Health professionals comprise the section and engage in clinical and translational research. General and subspecialty areas of child neurology include epilepsy, neurotrauma and stroke, neurocritical care, headache, demyelinating and other neuroimmune conditions, neonatal neurology and brain malformations, neuromuscular and movement disorders, as well as developmental and cognitive, neurogenetic and metabolic diseases.

Our Royal College of Physicians and Surgeons of Canada (RCPSC)-accredited Residency Training Program is among the largest in Canada and continues to maintain a 100 per cent success rate on the Royal College exam. All section members are actively engaged in teaching through undergraduate, medical school, residency, graduate student, and postdoctoral fellowship levels.

A rich educational environment now includes more than 10 academic rounds and conferences per week, the most prominent of which is the Developmental Neurosciences Grand Rounds.

During the 2015-2016 academic calendar year, the Section of Pediatric Neurology produced 88 peer-reviewed medical and scientific papers, and received $2.4 million in research funding for direct costs from extramural sponsors (including CIHR, NIH/NINDS, AIHS, Brain Canada, HSFC, NeuroDevNet, CPIRF, among others) and over $500,000 from intramural sources.

Additionally, section members have continued to play major leadership roles in numerous national and international professional societies.

▲ **Dr. Jong M. Rho**

Faculty

Karen Barlow, MD
Luis Bello-Espinosa, MD
Jeffrey Buchhalter, MD, PhD
Michael Esser, MD, PhD
Laura Flores-Sarnat, MD
Heather Graham, MD
Robert Haslam, MD (Emeritus)
Alice Ho, MD
Adam Kirton, MD
Jean Mah, MD
Aleksandra Mineyko, MD
Tamara Pringsheim, MD
Thilinie Rajapakse, MD*
Jong Rho, MD (Section Chief)
Harvey Sarnat, MD
Morris Scantlebury, MD
Kimberley Smyth, MD*

*Locum tenens physicians

Resident Staff

Momen Al-Momen, MD
Marvin Braun, MD, PhD
Megan Crone, MD
Colleen Curtis, MD
Philip de Guzman, MD, PhD
Natarie Liu, MD
Kara Murias, MD
Robyn McPherson, MD
Jaden Wright, MD

Department of Clinical Neurosciences 2015-2016 Neurosurgery 33

The Section of Neurosurgery

Section Head: Dr. John Wong

THE SECTION OF NEUROSURGERY AT THE University of Calgary and Alberta Health Services is fully integrated with its partner sections of Neurology, Physical Medicine and Rehabilitation (PM&R) and Translational Neurosciences within the Department of Clinical Neurosciences.

With this highly integrated and programmatic approach, sub-specialized care is provided to our patient population. This population includes the geographic region of Southern Alberta as well as Eastern British Columbia in the Kootenay Region and Western Saskatchewan, encompassing an approximate catchment population of 2.5 million. Care is provided by 16 neurosurgeons, all of whom are sub-specialists and also provide general and emergency neurosurgical services.

Specialized programs include cerebrovascular and endovascular neurosurgery, epilepsy neurosurgery, adult hydrocephalus, neuro-oncology, skull base surgery, pediatric neurosurgery, peripheral nerve surgery, functional neurosurgery, stereotactic radiosurgery and spine surgery. In partnership with neurology, rehabilitation medicine, orthopedic surgery, neuroradiology, and radiation oncology, our members provide the highest quality of sub-specialized care for this patient population.

The total operative volume delivered by neurosurgeons was 1,996 cases in 2015-16, with 1,896 operative cases at Foothills Medical Centre and 100 at Alberta Children's Hospital. There were another approximately 100 cases of bedside and Intensive Care Unit procedures, about 300 cases of endovascular procedures in the neuro-interventional suite, and roughly 100 radiosurgery cases.

Highlights

- Dr. Jay Riva-Cambrin, our recent recruit from the University of Utah School of Medicine, joined our pediatric neurosurgery team at the Alberta Children's Hospital. Dr. Riva-Cambrin, a well-respected clinician-researcher and surgeon, assumed the mantle of neurosurgery residency program director from Dr. John Hurlbert.
- After two decades of service and commitment, Dr. John Hurlbert left our institution to become Co-Director of the Spine Program in the Department of Surgery at the University of Arizona in Tucson. Dr. Hurlbert's contributions to organized spinal neurosurgery and medical education on a national level are well known and his departure marked a loss to Calgary and Canada.
- Our academic highlight remains the Charles Taylor Memorial Lectureship that pays homage to Calgary's first neurosurgeon. In 2016, Dr. Robert Spinner, Chair of the Department of Neurological Surgery and Professor of Neurosurgery and Orthopedics and Anatomy from the Mayo Clinic, was the 12th Annual Charles Taylor lecturer.
- Numerous respected professors and neurosurgeons visited us this past year, including Drs. Manashe Zaaroor (Rambam Health Care Campus, Israel), Chris Honey (University of British Columbia), Adnan Siddiqui (University of Buffalo), David Kallmes (Mayo Clinic), Fred Lenz (Johns Hopkins), Babu Welch (University of Texas Southwestern), Andres Lozano (University of Toronto), and Norm Relkin (Weill Cornell Medical College).
- For the ninth year running, the highly regarded Spine and Peripheral Nerve Anatomy and Surgery Course exposed neurosurgery and orthopedic residents from across the country to the nuances of spine and peripheral nerve surgery in a unique, hands-on supportive environment using didactic and cadaveric methods.
- In 2015, Dr. Garnette Sutherland was awarded the University of Calgary, Department of Surgery, Distinguished Service Award.

Education

The neurosurgery residency training program continues to be the pride of the section. Two new residents are accepted each year, with a current allotment of 17 trainees. The program is known for providing training in a collaborative and collegial environment where the highest quality of service and education are delivered.

In addition to hands-on and didactic teaching of residents, the faculty contributes significantly to undergraduate medical education teaching in the small group curriculum, as well as clerkship rotations. Nine fellows joined our section in various subspecialties, which is another positive indicator of Calgary's strong reputation for excellent training and care.

Research

Members continue to be involved in intensive research, with several of them having peer reviewed and funded basic science and or clinical research programs.

Many of these members partner with the Hotchkiss Brain Institute, and several faculty members have been granted full or affiliated membership. Areas of research strength and accomplishment include clinical trials in spinal cord injury research, basic bench research in nerve regeneration, deep brain stimulation, traumatic brain injury, laboratory work using brain tumour initiating stem cells, and intravascular stent development.

We also proudly house one of the world's foremost laboratories in surgical robotics.

▼ Stryker's Mobile Operating Room Experience visited Calgary in May 2016.

Neurosurgeon brings pioneering hydrocephalus procedure to city

Story by Greg Harris

CALGARY IS THE ONLY CENTRE IN Western Canada that offers an innovative surgical procedure to treat babies with hydrocephalus, which is a buildup of fluid in the brain.

Performed by pediatric neurosurgeon Dr. Jay Riva-Cambrin at Alberta Children's Hospital, the minimally invasive procedure involves creating new channels for the cerebrospinal fluid to drain and circulate normally, and then eliminating some of the tissue that creates the excess fluid.

Standard practice is to place an internal shunt, or tube, to drain the fluid into the abdominal cavity, where it is reabsorbed by the body. However, infection is a common risk with shunts. People with shunts sometimes face multiple neurosurgeries over their lifetimes to repair the problems that can arise.

"Right now, this is one of the hottest topics in pediatric neurosurgery," says Dr. Riva-Cambrin, who brought the technique to Calgary last year after receiving training from surgeons in Mbale, Uganda, and Boston Children's Hospital.

"The quality of life for these children is substantially improved when we can eliminate the risks of infection and the need for implanted hardware. It will be less likely that they'll have to have more brain surgeries as they grow up."

The full name of the procedure is endoscopic third ventriculostomy with choroid plexus cauterization (ETV/CPC). During the operation, the surgeon creates a small opening in the skull, then uses a tiny camera to guide miniature surgical tools to create a bypass for the blocked cerebrospinal fluid.

The second part of the procedure involves cauterizing and thereby disabling some of the choroid plexus, a type of tissue that creates much of the cerebrospinal fluid.

About two-thirds of infants with hydrocephalus are eligible for the procedure, according to Dr. Riva-Cambrin. Generally they must be under 24 months of age and have an MRI that confirms there is minimal scarring in the exit passageway.

About 50 to 60 babies are treated for hydrocephalus in Alberta every year; about half of those are from the Calgary area. Without treatment, pressure from accumulating fluid inside the brain and skull is eventually fatal.

Dr. Riva-Cambrin can perform the ETV/CPC procedure on eligible patients from Alberta, Eastern B.C. and Western Saskatchewan. He is currently working with colleagues in Edmonton to introduce the procedure there.

Lauren and Jamie Plessis's daughter, Baya, developed an infection at birth that required three weeks of treatment in hospital before she could go home. Five months later, a routine checkup revealed her skull was growing too rapidly.

"We saw a pediatrician, who immediately told us there was likely pressure building up because of hydrocephalus," Lauren says. "Baya went in for an MRI right away and then, a week later, she was in surgery. She's been stronger than all of us throughout this."

Because she was still under 24 months of age, Baya was a good candidate for the ETV/CPC procedure. Both parents are relieved she won't have a permanent shunt. "Dr. Riva-Cambrin is a hero to us," says Baya's dad Jamie. "He gave us our baby back."

In Baya's case, she may have developed bleeding in her brain, then a blood clot, and then scar tissue that could have impeded the flow of the cerebrospinal fluid.

A child with a shunt will need to be monitored yearly. Although they can otherwise lead normal lives, it's not unusual that they will require anywhere from two to 30 surgeries to replace the shunt, Dr. Riva-Cambrin says. By comparison, the ETV/CPC procedure eliminates the risk of infection and hardware failure, but can still require additional surgery in about one-third of cases due to the body closing over the hole made by the surgeon.

▲ DCNS neurosurgeon Dr. Jay Riva-Cambrin

Only two neurosurgeons in Canada have been trained in the procedure, according to Dr. Riva-Cambrin. It was developed by Dr. Benjamin Warf as a solution for children in Africa, where medical supports aren't ideal for the lifelong maintenance of shunts. Dr. Warf then brought the procedure to Boston Children's Hospital.

Dr. Riva-Cambrin performed about 70 of the procedures in Salt Lake City before moving to Calgary, where he has performed seven since arriving last September.

The University of Calgary and the Alberta Children's Hospital are currently taking part in many studies examining the effects of the ETV/CPC procedure, and further evaluating who make the best candidates. Dr. Riva-Cambrin is also actively involved in developing endoscopy programs and research projects in both Uganda and Mali in Africa.

Spine triage project reducing wait times by eliminating treatment 'silos'

AN INNOVATIVE QUALITY IMPROVEMENT project at Foothills Hospital is not only reducing waiting times to see a spine consultant, but it's giving patients peace of mind that their chronic symptoms are thoroughly diagnosed and addressed.

Before the Spine Triage and Assessment Clinic (STAC) was implemented on the 12th floor of the hospital, wait times for neurosurgical consultations were at a crisis level. With 1,800 patients waiting to be seen, the clinic was stretched to the breaking point.

"Patients were so frustrated having to wait so long," says Dr. Xinxin Shao, one of three spine physicians working in STAC under the Clinical Assistant program. She recalls that many arrived at the clinic with little diagnoses other than, "My family physician said I need to see a surgeon."

In reality, the vast majority don't need to see surgeon—but they need a diagnosis so they can return to their family physician and move forward with other therapies.

The solution was to intercept patients who were waiting for a neurosurgical consultation and conduct a medical examination and history on each to determine which ones were ideal surgical candidates.

"We tried to make the referral a little more efficient and get patients, early on in their referral process, to the right people," says neurosurgeon Dr. Stephan du Plessis, who oversees the STAC program along with Dr. Brad Jacobs, Dr. Steven Casha and Dr. Mahmoud Benour.

By having physiatrists in the clinic—along with neurosurgeons—those patients who don't require surgery still leave with an understanding of their diagnosis and a plan to address their condition.

"(Patients) are getting a full interdisciplinary assessment in one visit—saving costs for the system and providing better care," says physiatrist Dr. Vishal Tulsi.

The approach is benefiting all involved.

"It's like we've taken all these silos and we've lumped them together," says Dr. du Plessis. "Now patients come in and they can see all three—they can see the triage physicians; they can see the surgeon if they need to; they can see the physiatrist if they need to."

"When they come here we take a complete history from the patient, we do a comprehensive neurological examination and then we review with the patient all the X-rays, CT scans or MRIs," says Clinical Assistant Dr. Ahmed Saidahmed.

That thorough assessment—and patient education—gives comfort to those who may have been suffering with chronic pain for years.

"We have a one-hour appointment time for each patient," says Dr. Ranjeet Gaekwad. "And the surgeons are readily available so we can find out whether a patient is surgical or not. And, in a clear-cut surgical case, we can sign a consent and book them for surgery."

Before STAC, some patients were waiting a year or longer to see a neurosurgeon—only to find out that surgery was not appropriate for their condition.

Explains Dr. Saidahmed: "There are other co-morbidities, like shoulder pain or hip pain, that can mimic spine-related symptoms. Before, they used to wait 18 months to see a spine surgeon to be told that it's mainly a shoulder (issue)."

Now, in as little as four to six weeks, non-surgical patients can be seen, diagnosed, and returned to their family physician with a treatment plan.

"We're getting more satisfied patients who are walking out saying, 'at least I know I'm not a surgical candidate—and I've got answers in terms of how I can manage things better'," says Dr. Tulsi.

Remarkably, up to 85 per cent of patients referred don't need surgery.

"We've made a big improvement in the capacity that we can deal with," says Dr. du Plessis. "I'm quite proud of what we've accomplished."

But the neurosurgeon says the next bottleneck is operating room time, which currently limits the number of surgical patients they can help.

"For people that don't need surgery, there are many other options: physiotherapy, chiropractic treatment, exercises, injections. But patients with surgical problems have a pathology that is only treatable with surgery, and if they can't get the surgical treatment, they deteriorate.

▶ Neurosurgeon Dr. Stephan du Plessis

Alberta Radiosurgery Centre

Program Leads: Dr. Gerald Lim, Dr. Yves Starreveld

Overview

This radiosurgery program was the first of its kind in Canada to use an innovative technology called the Novalis system. It is a collaborative effort between the sections of Neurosurgery and Radiation Oncology.

The technology offers focused radiation treatment for diseases of the brain and spinal cord in single or multiple sessions as appropriate. This avoids lengthy hospital stays associated with standard surgical treatments. By reducing risks of therapy, and allowing a rapid return to normal activities, this treatment offers greater patient satisfaction.

Since its inception in 2002, the program has served an increasing number of patients in Alberta and across the western provinces.

Highlights

Referrals to our spine radiosurgery program are increasing. We have started to treat patients with epilepsy, including mesial temporal lobe epilepsy.

Education

The program provides fellowship training for both radiation oncologists and neurosurgeons.

Research

Projects include a study on the effect of contouring variability on dosimetric parameters for brain metastases.

Our quality improvement initiative has lead to impressive gains in efficiency of treatment, and ongoing revisions to our patient care pathways.

Members

Neurosurgery:
Dr. Yves Starreveld, Dr. Zelma Kiss, Dr. John Kelly, Dr. Brad Jacobs, Dr. John Wong

Radiation Oncology:
Dr. Gerald Lim, Dr. Rob Nordal, Dr. Jon-Paul Voroney, Dr. Shaun Loewen

Medical Physics:
David Spencer, Alana Hudson, Nicholas Ploquin, Greg Pierce

Nursing:
Rhonda Manthey

The Hydrocephalus Program

Program Lead: Dr. Mark Hamilton

Overview

In 2003, the University of Calgary's adult hydrocephalus clinic was established with the goal to standardize and enhance the care for adult patients with hydrocephalus. Hydrocephalus patients had typically been assessed and cared for by individual physicians in an unstructured and unfocused clinic environment. The population of adult patients with hydrocephalus is increasing as diagnostic and therapeutic techniques improve identification and survival of treated patients. Hydrocephalus represents a treatable cause for approximately five per cent of adult patients with a diagnosis of dementia.

The University of Calgary Adult Hydrocephalus Program was developed in response to the strengths of the adult hydrocephalus clinic. Targeting the care of adult patients with hydrocephalus in a specialty clinic has aided in understanding the natural history of adults with untreated hydrocephalus. The program has helped to standardize the treatment strategies for patients with a potential diagnosis of hydrocephalus and it has helped to improve the management of patients with hydrocephalus using shunts and endoscopic techniques. In 2016, there were approximately 1,800 patients followed in the adult hydrocephalus clinic. There were approximately 1,200 outpatient assessments and 200 surgical procedures performed.

Highlights

- The Adult Hydrocephalus Clinical Research Network (AHCRN): Dr. Hamilton is the Chair for AHCRN, which has two centres in Canada and four in the United States. AHCRN has enrolled approximately 450 patients in 18 months and is starting a clinical trial for patients with normal pressure hydrocephalus.
- Dr. Hamilton was the Congress President for Hydrocephalus 2015, held in Calgary and Banff from Sept. 17-21, 2015. This was the seventh annual meeting of the International Society for Hydrocephalus and Cerebrospinal Fluid Disorders (ISHCSF). There were 300 international participants. This meeting included the "Calgary Hydrocephalus Symposium" with 10 international experts discussing hydrocephalus care.
- Dr. Hamilton is a member of the board of directors and president-elect of the International Society for Hydrocephalus and Cerebrospinal Fluid disorders (ISHCSF).
- Dr. Hamilton is a member of the board of directors of the Hydrocephalus Association and the medical advisory board of the Hydrocephalus Association.
- Dr. Hamilton is helping to develop a Canadian hydrocephalus strategy with efforts to create a Canadian Hydrocephalus Association.

Education

The Hydrocephalus Program offers fellowship training for neurosurgeons interested in subspecialty training in the diagnosis and management of adult patients. The first trainee completed his fellowship training in June 2012.

Research

- Initiation of the Adult Hydrocephalus Clinical Research Network
- Neuroendoscopy treatment and outcome for adult patients with hydrocephalus
- Neuropsychological effects of endoscopic treatment of patients with hydrocephalus
- Infections in patients with ventricular catheters and shunts
- Improving surgical outcomes for treatment with ventriculoperitoneal shunts
- Treatment of patients with idiopathic normal pressure hydrocephalus
- Transition care for pediatric patients with hydrocephalus
- Endoscopic management of patients with ventricular brain tumours

Members

Neurosurgeons: Dr. Mark Hamilton, Dr. Clare Gallagher, Dr. Walter Hader
Medical and Surgical Assistant: Dr. Geberth Urbaneja
Neurologist: Dr. David Patry
Neuro-ophthalmologists: Dr. Fiona Costello, Dr. Bill Fletcher, Dr. Suresh Subramaniam
Geriatrician: Dr. David Hogan
Nurse Practitioner: Ron Prince
Administration Support: Sandy Johnson, Brittney Labelle

Image-Guided Medical Robotics Program

Program Lead: Dr. Garnette Sutherland

Overview

The Intraoperative MRI (iMRI) Program, developed by Dr. Sutherland in collaboration with the National Research Council (NRC) Canada, uses a ceiling mounted 3.0T magnet. The system has been used in neurosurgery in over 850 cases. Together with the original 1.5T iMRI system, the case number is now over 1,900. Several years ago, this technology was spun into a company called IMRIS that now has 62 international sites with over 20,000 cases worldwide.

Into this environment we have integrated neuroArm, the world's first image-guided, MR-compatible robot, also developed by Dr. Sutherland and team in collaboration with MacDonald, Dettwiler and Associates (MDA). The robot is capable of both microsurgery and stereotaxy, and has now been used in 70 cases. Over the past several years, the commercial version called SYMBIS has been developed and recently received FDA approval for sales in U.S. centres. SYMBIS is presently undergoing hardware/software testing and calibration at the Project neuroArm research facility. Based on these technologies and the track record of advancing medical robotics, Dr. Sutherland's team has begun the process of building CellArm, a compact, cost-effective and functional robot for whole body application, with the ability to operate at cellular level and the potential to move robotic procedures from highly specialized tertiary care hospitals to smaller community centres.

Highlights

With the support of a recently awarded CIHR-NSERC partnered grant, the project has now developed an innovative neurosurgery-specific haptic hand controller for robot-assisted surgery. The prototype is set to be linked to the Kuka robot sited in Advanced Haptics and Prototyping laboratory in Project neuroArm, to undergo pre-clinical testing and evaluation. Dr. Hamidreza Hoshyarmanesh, PhD Mechatronics and postdoctoral fellow, has been instrumental in spearheading this challenging project. Relocated from his home country of Iran only a year ago, Dr. Hoshyarmanesh creatively balances the mechanical, electrical and software aspects of Project neuroArm's strong engineering base.

He works closely with Project neuroArm Chief Engineer and DCNS Adjunct Assistant Professor Kourosh Zareinia, PhD Electrical Engineering. Dr. Zareinia leads and oversees the engineering division, complementing Dr. Sutherland's visions of technology creation in medical robotics and related domains.

To strengthen the molecular biology and imaging initiatives of Project neuroArm, we were successful in recruiting Dustin Proctor, PhD Molecular Biology-Neuroscience. Related to this, Dr. Proctor has led and expanded the brain tumour research through molecular genetics of meningioma, and brain tumour tissue interrogation with vibration profiling, correlating to their metabolic and molecular signature. Manuscripts and abstracts in these areas have been published, with some in submission. Dr. Proctor has also been working on the tissue biology of nervous system trauma, together with Dr. Sanju Lama whose PhD thesis interrogated the metabolic and molecular perturbation of traumatic brain injury (TBI) using MR spectroscopy and MR imaging.

University of Calgary Eyes High postdoctoral fellow and Killam Laureate Dr. Yaser Maddahi, continues his work towards the development of an MR-compatible haptic hand controller. This hand-controller is designed for use in the assessment of brain function using functional MRI during the performance of virtual surgery. In addition, Dr. Maddahi has also been collaborating with the University of Manitoba engineering team of Professor Ekram Hossein in developing a robot assisted space telemetry (RAST) simulation platform. The system is designed to test the feasibility of conducting remote-controlled, robot-assisted tasks and procedures by a robot sited at the International Space Station, when linked to an earth based control station / command centre at Project neuroArm—a principle similar to the neuroArm system. The project also relates directly to Dr. Sutherland's executive membership with the Canadian Space Agency Human Space Flight Consultation Committee.

Project neuroArm postdoctoral fellow alum Dr. Ahmad Ghasemloonia, PhD Mechanical Engineering, was successful in obtaining a faculty position at the Schulich School of Engineering.

◀ Dr. Garnette Sutherland and neuroArm were featured in Calgary Economic Development's Be Part of the Energy campaign.

Dr. Ghasemloonia made considerable progress in developing robotic toolsets for both head and neck surgery and neurosurgery. Through ongoing collaborations with Dr. Joseph Dort, Head and Neck Surgery, he worked with the group (specifically Dr. Zareinia and MSc student Peter Hillman) in the design and development of an articulated wrist tool for robotic surgery. At the University of Calgary's Microscopy and Imaging Facility, Dr. Ghasemloonia played an important role in the measurement, analysis and interpretation of data for interrogation of brain tumour cells and tissues through their unique vibration profiles.

Well aligned with Project neuroArm's vision in advancing surgeon training and education through virtual reality and simulation paradigms, Sonny Chan, PhD Computer Science, has been conducting studies related to fusion of CT and MR imaging data onto his software algorithm to produce a patient-specific brain tumour simulation program for planning and performance of surgery. Talented Calgary neurosurgery resident Dr. Andrew Ryu (PGY 5) and Otolaryngology resident Dr. Justin Lui have assumed the clinical counterpart in providing both knowledge and feedback in creating an ideal surgical simulation system for resident education. Dr. Ryu, through his AIHS Clinical Fellowship award support, recently obtained an MSc at UC Berkeley and is conducting further research at Project neuroArm, working closely with Sonny Chan and Ahmed Mostafa (PhD student) in developing and testing a VR simulation platform for spine surgery.

Reflecting the ever expanding multi-disciplinary environment, Project neuroArm once again employed a number of summer students with multiple studentships and awards who had presented and participated in their respective symposia and workshops. Many continued their projects from 2015 and remain involved, including a few conducting Honours thesis-based projects.

Recognition

Keeping with the recognition and media attention that the iMRI and neuroArm technology receive, Dr. Sutherland, together with the neuroArm story, were featured in the Globe and Mail in April 2016. In June 2016, Dr. Sutherland was an invited panelist for the Best of Calgary Supposium, where he took the opportunity to inspire and attract inventors, innovators and dreamers to the City of Calgary. More recently, Dr. Sutherland and neuroArm technology were featured in a nationwide advertising campaign launched by Calgary Economic Development. The online message, with a global reach, continues to highlight Calgary as a lead centre for medical robotics.

CONTINUED ON PAGE 42

CONTINUED FROM PAGE 41

Education

International Tractography Workshop: In March 2016, Project neuroArm consolidated its collaboration with the University of Vienna and industrial partner Medtronic by hosting the second International DTI Tractography Workshop in North America. The workshop, chaired by Dr. Sutherland and co-ordinated by Dr. Sanju Lama, hosted 12 participants, including neurosurgeons from across North America and faculties from the University of Vienna. In addition to understanding and dissecting the complex brain white matter tracts, University of Calgary Chancellor and Canadian astronaut Robert Thirsk delivered a memorable motivational dinner lecture on the several challenges and glories of being an astronaut and how it may inspire neurosurgeons on their equally daunting profession.

Calgary Skull Base-Cranial Exposure Workshop and NeuroNight: On May 19, 2016, in collaboration with Stryker, Dr. Sutherland hosted a skull base cranial exposure workshop for neurosurgery residents and fellows across Canada. The workshop, the first of its kind in Canada, was intended to enhance surgical skill learning through hands-on use of new and advanced surgical drill technology on cadaveric heads. Stryker's new state-of-the-art mobile operating theater M.O.R.E (Mobile Operating Room Experience) lab was on site where participants were able to learn complex procedures necessary to complement and augment their skill set. Drs. Taku Sugiyama and Sanju Lama were assistant instructors to Dr. Sutherland, where an EC-IC bypass course (chicken wing model) was also provided at Project neuroArm research facility.

To further foster technology translation through industrial collaboration, the day was followed by an evening open-house that showcased advanced neuroscience technologies developed or being developed by Project neuroArm and Stryker Corporation. The evening brought together faculty, residents, nurse clinicians, scientists and support staff of the Departments of Clinical Neurosciences and Surgery, together with policy makers and engineers from Stryker.

Microvascular Bypass Course: With the addition of Dr. Taku Sugiyama, microvascular surgeon from Hokkaido University, Sapporo, Japan, Drs. Sutherland and Sugiyama hosted a series of half-day hands-on microvascular dissection-bypass courses for the neurosurgery residents in Calgary (November-December 2016). The course, performed in a live rat carotid artery model, is based on an in-depth comprehensive tutorial developed by Dr. Sugiyama and his colleagues at Hokkaido University. The team is also preparing a manual which will be available online as a guide for microvascular surgery.

Research

Haptic Hand-controller: A vital component of a robotic system is the human-machine interface, and in particular a haptic hand-controller, itself a small robot. With Project neuroArm Chief engineer Dr. Kourosh Zareinia and Hamidreza Hoshyarmanesh, postdoctoral fellow Mechanotrics, as engineering lead, Dr. Garnette Sutherland's group has now designed and developed the prototype of a neurosurgery specific haptic hand-controller. Such a hand-controller is need-based and is not commercially available. Following further testing and validation of the prototype in the laboratory, the technology is expected to undergo commercial product development in the near future. Intellectual property arisen from the project will be translated to Calgary based spin-off OrbSurgical Ltd. with potential for job creation here in Alberta.

Molecular Imaging (Brain Trauma/Tumours): Building upon our past accomplishment in developing brain tumour specific single domain antibody-nanoparticle complexes, Dr. Sanju Lama, MBBS, PhD, provides a leadership role in consolidating investigators from across Canada (Mehdi Arbabi-NRC Ottawa, Frank van Veggel-UVictoria, Boguslaw Tomanek-UCalgary and Michael Colicos-UCalgary) towards achieving something very special, i.e. the development of an MR-visible biomarker for TBI that does not presently exist. This research direction (patent filed) is important and has relevance in robotics, as through visualization of abnormal cells, robotic technology can be utilized for image-guided therapy in the operating room. With the addition of Dr. Dustin Proctor, Molecular Biology-Neuroscience, this leg of the project is greatly strengthened; now expanding to molecular characterization and interrogations of brain tumours.

Cell Vibration: In collaboration with Matthias Amrein, PhD, Director of Microscopy and Imaging Facility, we are presently interrogating brain tumour and disease processes based on their cellular vibration signature. Utilizing a unique Atomic Force Microscopy set-up, the team has conducted studies on neuronal cells and tissues. Tissue samples obtained from patients with brain tumours and epilepsy provided important information on the vibration patterns of different cells and tissues, allowing differentiation between tissue types. A manuscript based on the unique findings of this project is currently under review.

Force-sensing Bipolar Forceps: For the past four years the research group has been actively developing SmartForceps, a force sensing bipolar forceps for microsurgery. The technology not only allows measurement and quantification of tool-tissue interaction forces, but also, recently through discrimination analysis, is able to classify surgeons based on their skill level and experience. Following extensive preclinical testing and currently undergoing institutional clinical testing as an investigational device, the technology (patent filed) is approaching commercial translation. The group is presently working on creating an Intelligent Module based on machine learning that is capable of automatically recording, quantifying and analyzing force data, and prompting or warning the surgeon should force levels reach sub-optimal levels.

Surgical Simulation: State-of-the-art virtual environments allow surgeons to practice complex and difficult procedures within the safety of a computer simulation. Computer haptics and immersive 3D display technologies allow the surgeon to see, touch, and surgically manipulate a virtual model of the patient. Through Sonny Chan, the present simulation direction in our laboratory is well suited to expand the international connectivity amongst centres such as Stanford, Ohio State, London, ON, and Edmonton.

CellArm: Expanding neuroArm's reach and success, the team is now consolidating efforts towards building a compact, economical and functional robot for whole body application with the ability to operate at cellular level. Co-investigator Matthias Amrein will add the microscopy and optics domain onto this unique technology. With due endorsement from the University of Calgary Office of the Vice President Research, the project is currently undergoing fundraising and identification of expert partners for research and development. Dr. Sanju Lama has been overseeing the initiation aspect of the project, working with Drs. Sutherland, Zareinia, Hoshyarmanesh, industrial partners, university and various funding groups, towards preliminary concept, design architecture and prototype development. This ambitious and disruptive venture is poised to transform surgery from the current organ to cellular level, potentially moving robotics from tertiary care medical institutions to the community centres.

Members (includes active collaborators and senior students/trainees)

Engineering: Kourosh Zareinia, Yaser Maddahi, Hamidreza Hoshyarmanesh, Chris Macnab, Qiao Sun, Yaoping Hu, Salvatore Federico, Mahdi Tavakoli, Ekram Hossein, Shanlin Jiao, Rachael L'Orsa, Peter Hillman, Canaan Ng, Don Peterson

Science: Dustin Proctor, Eun Hee Yoo, Sonny Chan, Ahmed Mostafa, Desmond Larsen-Rosner, Kowther Hassan, Christina Sutherland, Boguslaw Tomanek, Calvin Bewsky, Mehdi Arbabi, Frank van Veggel, Michael Colicos, Stephanie Stotz, Matthias Amrein

Medicine: Sanju Lama, Andrew Ryu, Justin Liu, Stefan Wolfsberger, Fang Wei Yang, Andrea Becking, Taku Sugiyama, Phillip Park, Joseph Dort, Francis Sutherland, Garnette Sutherland

Administrative Support: Alison Shepherd

Industrial Partners: MDA (Brampton, ON); Deerfield-IMRIS (Minnetonka, MN); Stryker (Kalamazoo, MI); Medtronic (Minneapolis, MN); OrbSurgical Ltd. (Calgary)

Institutional Partners: National Research Council Canada, Canadian Space Agency, University of Manitoba, University of Alberta, University of Victoria, Washington University School of Medicine St. Louis, MO, University of Vienna, Austria and Imperial College London, UK

Neuromodulation Program

Program Lead: Dr. Zelma Kiss

Overview

Neuromodulation is the altering/modulation of nervous system function by means of implantable devices or neural prostheses. It includes peripheral nerve, spinal cord and brain electrical stimulation, as well as drug delivery devices. Numerous conditions are treated, including: movement disorders, epilepsy, pain, angina, treatment-resistant depression, spinal cord injury, headache, spasticity, gastroparesis and urinary incontinence. Other sections within DCNS, as well as specialists from many departments, are part of the program. Our committee experienced a year of renewal with new members joining: Drs. Yahya Aghakhani (epilepsy), Shunaha Kim-Fine (uro-gynecology), and Jenni Joo (pain).

Clinical Care

A highlight of this year was the early results of deep brain stimulation (DBS) for treatment-resistant depression. This Alberta Innovates Health Solutions funded pilot study will complete patient accrual in 2016, and of those who have reached at least six months followup, 50 per cent have responded (meaning a 50-per-cent reduction in depression severity scores). This is a remarkable improvement for these people.

The diaphragmatic pacing program continues to develop with another patient implanted this year and growing interest from other western Canadian centres.

The sacral nerve stimulation (SNS) program continues to be a unique clinical service in Western Canada. The program assessed 10 new patients, implanted two and revised eight. The movement disorders program received 17 new referrals, implanted 13 patients, replaced 14 batteries and followed about 125 people in total. Unfortunately, the neuromodulation nurses in this program are at capacity, leading to a 1.5-year wait to get to surgery.

The baclofen pump program follows 30 patients with pumps for spasticity, with one new patient implanted in the adult group, four completed test injection and are waiting for OR time for implantation. The challenge over the past year was the graduation of eight to 10 pediatric patients from Alberta Children's Hospital to Foothills Hospital, which does not have the nursing capacity to manage these numbers.

Education

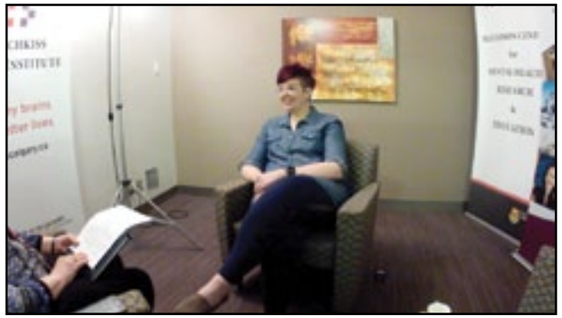
Our training program attracts residents, summer and graduate students, and postdoctoral fellows. Dr. Philippe Magown was the stereotactic / functional neurosurgery fellow and Dr. Rafael Andrade, a final year resident from Brazil, was with us for two months. Post-PhD fellows include Drs. Darren Clark and Elliot Brown, both of whom received three-year AIHS fellowships. A new fellow, Dr. Nick Strzalkowski, started in May as a University of Calgary Eyes High postdoctoral fellow. Two doctoral students, Linda Kim and Sohail Noor, continue studying mechanisms and new targets of DBS in animal models.

From the nursing perspective, the movement disorder surgery nurses visited Boston Scientific product development in California to learn about the new types of DBS systems available in Canada.

Research

We published papers on local field potentials as a biomarker of depression in Biological Psychiatry, mechanisms of action of DBS in the Journal of Neurophysiology, and how different parameters of DBS alter output pathways in the journal NeuroImage, as well as collaborative research on new instrumentation to study DBS in rodents published in engineering journals.

Our team members had poster or oral presentations at the Society of Biological Psychiatry, Society for Neuroscience, Neural Interfaces Conferences, First Middle Eastern Conference on Stereotactic and Functional Neurosurgery, as well as the American Society of Stereotactic and Functional Neurosurgery.



◀ Jessica Ward-King talks about her experiences with deep brain stimulation for treatment-resistant depression in a video about the AIHS-funded pilot study.

Our fellow will be presenting results of occipital nerve stimulation for craniofacial pain syndromes at the Canadian Neuromodulation Society meeting in September.

Future Directions

In the coming year we look forward to hiring a new functional / stereotactic neurosurgeon and using non-invasive neuromodulatory techniques (e.g. transcranial magnetic stimulation) to screen patients for these implantable therapies. The addition of a MR-guided focused ultrasound system will provide more options for patients who are not candidates for implanted neuromodulation systems and will result in new research directions.

Members

Cardiology: Dr. Jim Stone

Gastroenterology: Drs. Christopher Andrews, Phil Mitchell

Neurology: Drs. Yahya Aghakhani, Werner Becker, Scott Kraft

Neurosurgery: Drs. Walter Hader, Mark Hamilton, Zelma Kiss

Nursing: Sandra Golding (UofC research), Cheri Gray, Kara Hallett, Colleen Harris, Brittany Hoffarth-Palchewich, Karen Hunka, Pia Lawrence, Jackie Martini, Raj Parmar, Valerie Sherwood, Sandy Stephen, Meredith Wild

Pain Physicians: Drs. Jenni Joo, John Pereira, Kelly Shinkaruk (Chronic Pain Centre)

Physical Medicine and Rehabilitation: Drs. Chester Ho, Dan McGowan

Physiotherapy: Cliona Corbett

Psychiatry: Drs. Aaron Mackie, Jeremy Quickfall, Raj Ramasubbu

Psychology: Drs. Arlene Cox, Angela Haffenden

Respirology/Thoracic surgery: Drs. Sean McFadden, Karen Rimmer

Urogynecology: Drs. Shuhana Kim-Fine, Magali Robert

Neurovascular Program

Program Lead: Dr. John Wong

Overview

The Neurovascular Program is a joint collaborative effort of specialists and Allied Health staff from multiple disciplines to combat stroke and neurovascular disease. Many patients are treated in a single day using minimally invasive endovascular approaches, thereby avoiding long hospital stays. Expertise is maintained in the provision of open cerebrovascular neurosurgery to Albertans. In conjunction with our internationally recognized stroke team, the Neurovascular Program has become an important partner in stroke care and research.

Highlights

Approximately 700 patients with neurovascular disease were seen in the past year in our specialized outpatient clinic for evaluation and followup. Currently, about 300 patients are treated annually via minimally invasive endovascular means such as aneurysm coiling, vascular malformation embolization, carotid stenting and endovascular stroke treatment. An integrated relationship with the Alberta Radiosurgery Centre, which was the first to use special shaped-beam focused radiotherapy techniques in Canada, has allowed the non-invasive and safe treatment of patients with complex arteriovenous malformations. Over the years we have consolidated the outpatient experience and launched the Neurovascular Clinic in Calgary in conjunction with specialists from neurosurgery, neurology, radiology and nursing. This has allowed the rapid same-day triage and evaluation of stroke patients to provide high-quality care and further opportunities for teaching and clinical studies.

Education

Educational highlights have included the recruitment of clinical fellows in endovascular training and open neurosurgical techniques.

Research

Academic initiatives have centred upon the development by Dr. Alim Mitha of a basic science laboratory for creating new intravascular devices for stroke care and the pioneering, Calgary-led international multi-centre study of acute stroke intervention (ESCAPE and ESCAPE NA-1).

Members

Dr. John Wong, Dr. Alim Mitha,
Dr. Garnette Sutherland, Dr. William Morrish,
Dr. Mayank Goyal, Dr. Muneer Eesa

Nursing: Leslie Zimmel, Michelle Gillies

Fellows: Dr. Saad Al-Qahtani, Dr. Javed Khader-Eliyas

Pediatric Neurosurgery Program

Program Lead: Dr. Walter Hader

Overview

The Pediatric Neurosurgery Program offers all aspects of neurosurgical care in children, including: management of hydrocephalus; brain and spinal injury; myelomeningocele; other forms of spinal dysraphism; refractory epilepsy surgery; spasticity; craniofacial disorders; and pediatric brain tumour.

All members' primary affiliation is with the Department of Clinical Neurosciences, while the pediatric neurosurgery section operates within the Section of Pediatric Surgery at Alberta Children's Hospital.

Highlights

Dr. Jay Riva-Cambrin, a clinical epidemiologist and pediatric neurosurgeon, joined the pediatric team at Alberta Children's Hospital in September 2015. Dr. Riva-Cambrin completed medical school at the University of Alberta prior to completing his neurosurgery training at the University of Toronto. He completed a master's in Clinical Epidemiology and subsequently a pediatric neurosurgery fellowship at SickKids Hospital in Toronto prior to joining the faculty at the Primary Children's Hospital in Salt Lake City, Utah. He brings a wealth of experience in both clinical pediatric neurosurgery and clinical research, and as an integral member of the Hydrocephalus Clinical Research Network (HCRN). In January 2016, he became the director of the Neurosurgery Residency Program. The inaugural Joggin for a Noggin fun run last Halloween, lead by Kelly Bullivant, was hugely successful and helped provide funding for over 30 neurosurgery children to attend the first Camp Everest South at Camp Easter Seals for a week-long summer camp this year.

Research

Dr. Riva-Cambrin has recently been successful in establishing Calgary as an international centre in the Hydrocephalus Clinical Research Network (HCRN). All Calgary patients treated for hydrocephalus will have the opportunity to be part of multiple prospective trials in both endoscopic and ventriculoperitoneal shunt treatments for hydrocephalus. An ongoing quality assurance initiative to reduce shunt infection at Alberta Children's Hospital, based on HCRN protocols, have produced dramatic reductions in shunt infection rates over three years. Pediatric neurosurgery continues to be an active participant in the Canadian Pediatric Neurosurgery research study group and contributed to another multi-centre publication on Pediatric Thalamic Tumours in the MRI era: A Canadian Perspective in February 2016.

Members

Neurosurgeons: Dr. Walter Hader,
Dr. Clare Gallagher, Dr. Jay Riva-Cambrin

Pediatricians: Dr. Heather Graham,
Dr. Keith Jorgensen

Nurse Practitioner: Kelly Bullivant

Nurse Clinicians: Valerie Sherwood, Linda Gill

Peripheral Nerve Program

Program Lead: Dr. Rajiv Midha

Overview

The Surgical Peripheral Nerve Program is a multi-disciplinary and inter-disciplinary program encompassing clinical, physiotherapy and electro-diagnostic services. Our program focuses on the diagnosis and treatment of a variety of peripheral nerve problems including: complex peripheral nerve injuries, nerve tumours, brachial plexus surgery and advanced nerve repair and nerve transfer techniques. Our goal is to minimize pain and to maximize function, providing a better quality of life for patients living with these painful and disabling disorders.

Highlights

The Multidisciplinary Peripheral Nerve Clinic welcomed the addition of Dr. Justin Yeung (plastic and reconstructive surgeon) to the team.

Research

Research is an important aspect of the Peripheral Nerve Program. Dr. Midha runs an independent basic science research laboratory in association with the Hotchkiss Brain Institute, investigating various facets of peripheral nerve regeneration and repair. For more information on these research initiatives, visit www.hbi.ucalgary.ca.

Education

We support the educational initiatives of all residents within the three clinical sections of DCNS and have a robust fellowship program. The following are recent fellows within the program:

Dr. Helene Khoung (2010-12)
Dr. Ferry Sanjaya (2011-12)
Dr. Chandan Mohanty (2012-2013)
Dr. Tarek El Madhoun (2014)
Dr. Yuval Shapira (2015)
Dr. Mustafa Nadi (2016)

Members

Medical Neurologists, Physiatrists & Electrodiagnostics: Dr. Chris White, Dr. Stephen McNeil

Neurosurgeon: Dr. Rajiv Midha

Plastic Surgeons: Dr. Christiaan Schrag, Dr. Robertson Harrop, Dr. Justin Yeung

Physiotherapy: Margaret Hass

Intraoperative Electrophysiology Support: Michael Rigby, Erin Phillip

PITNET

Program Leads: Dr. Fiona Costello, Dr. Yves Starreveld

Overview

The Pituitary Inter-disciplinary Team-based Endocrine Treatment Program (PITNET) has been active for over three years, bringing together neurosurgery, neuro-ophthalmology, otolaryngology and endocrinology to facilitate the care of patients with pituitary tumours.

Our combined neurosurgery/neuro-ophthalmology new patient and followup clinic have reduced clinic visits for many patients.

Highlights

- Sasha Rogers, our new fellow, is joining us from Brisbane, Australia in July 2017.
- The PITNET team is working with Guideline Utilization Resource Unit (GURU), CancerControl Alberta, to revise existing guidelines in the management of pituitary tumours.

Research

Current research directions are focused on cost-effectiveness, the role of optical coherence tomography in patient management, comparisons of surgical approaches, and an exciting new project on fMRI in optic compressive neuropathy funded by a PFUN seed grant.

Education

Due to the high concentration of surgical patients, we have been able to provide focused training on the diagnosis and management of these lesions to residents and visiting neurosurgical fellows, and residents in the Section of Neurosurgery.

Members

Endocrinology:
Dr. Shelly Bhayana, Dr. Bernard Corenblum, Dr. Alun Edwards, Dr. Munish Khosla, Dr. Sue Pedersen, Dr. Doreen Rabi

Neurology:
Dr. Fiona Costello, Dr. Bill Fletcher, Dr. Suresh Subramaniam

Neurosurgery:
Dr. Garnette Sutherland, Dr. Alim Mitha, Dr. Yves Starreveld

Otolaryngology:
Dr. Brad Mechor, Dr. Luke Rudmik

Skull Base and Endoscopic Surgery Program

Program Lead: Dr. Yves Starreveld

Overview

In conjunction with colleagues from the Section of Otolaryngology, the skull-base surgery group combines clinical expertise with novel approaches to offer patients the best surgical treatment and long-term medical care for these challenging lesions.

In addition, close ties to both the Section of Endocrinology and the Alberta Radiosurgery Centre ensure that the nonsurgical aspects of treatment are also managed appropriately. Endoscopic approaches to pituitary and anterior skull base lesions are also offered when appropriate.

The program offers fellowship training to neurosurgeons.

Research

Specific research initiatives include:

- clinical epidemiology, image guidance, robotic surgery, and surgical simulation;
- comparison of outcomes following different endoscopic approaches to pituitary tumours.

Members

Neurosurgery: Dr. Yves Starreveld, Dr. Alim Mitha, Dr. Garnette Sutherland

Otolaryngology: Dr. Brad Mechor, Dr. Phil Park, Dr. Luke Rudmik, Dr. Joe Dort

Electrophysiology: Erin Phillips, Michael Rigby

The Surgical Neuro-oncology Program

Program Lead: Dr. Mark Hamilton

Overview

As a multi-disciplinary program in DCNS, the Surgical Neuro-oncology Program was established to focus on neurosurgical care for brain tumour patients. The program provides excellent care and it improves care in the future through education, research and advocacy.

Our patients have both low grade and malignant brain tumours, including those involving the brain and the skull base. Neurosurgeons work in concert with neuro-oncologists, neuroradiologists, neuropathologists, and radiation oncologists specializing in the treatment of brain tumours. Regular clinical meetings and teaching rounds occur to co-ordinate care plans for patients. We are also able to offer access to unique treatment modalities, such as the intraoperative MRI theatre for assisting in the surgical treatment of brain tumour and intraoperative monitoring or cortical mapping for complex brain tumour resection.

Our program provides:

- Surgical treatment of patients with malignant brain tumour
- Surgical management of patients with low-grade glioma
- Clinical trials for adjuvant treatment of patients with malignant brain tumour
- Treatment wait times and outcomes for brain tumour patients
- Endoscopic treatment of patients with skull base or pituitary tumours

Education

The program provides fellowship training for neurosurgeons who want to develop special skills in surgical neuro-oncology.

Research

Members of the program are actively involved in clinical research to test new and innovative therapies to treat patients with brain tumours. Dr. Hamilton and Dr. Kelly are members of the Clark H. Smith Brain Tumour Centre, The Southern Alberta Cancer Research Institute, and the Hotchkiss Brain Institute, as well as participants in the Terry Fox Research Initiative.

All neurosurgeons are participants in multi-centre clinical trials, including those involving convection-enhanced delivery of agents into the brain to treat brain tumours and brain tumour vaccines. In addition, the Brain Tumour Tissue Bank is available to store tissue from consenting patients for current and future research.

Members

Neurosurgeons: Dr. Mark Hamilton, Dr. Yves Starreveld, Dr. John Kelly, Dr. Garnette Sutherland

Neuro-Oncologists: Dr. Paula de Robles, Dr. Greg Cairncross, Dr. Gloria Roldan

Radiation Oncologists: Dr. Rob Nordal, Dr. Gerald Lim

Nurse Clinician: Crystal Tellett

Surgical Neuro-Oncology Nurse: Chelsea Demler

The Section of Physical Medicine & Rehabilitation

Section Head: Dr. Chester Ho

THE SECTION OF PM&R HAS 29 MEMBERS, working in diverse settings from tertiary acute care hospitals to community practice. Our practice focuses on the diagnosis, management and rehabilitation of patients with neurological conditions (e.g. brain injury, spinal cord injury, stroke) and those with musculoskeletal problems (e.g. back pain, burn injuries, amputation).

We serve the needs of both children and adults in Southern Alberta, Eastern British Columbia and Western Saskatchewan.

Highlights

- Dr. Denise Hill was the President of the Alberta Physiatry Association for 2015-2016.
- Dr. Vince Gabriel was elected to the Board of Directors of the American Burn Association in 2016.
- Dr. Gentson Leung took over as the new Residency Program Director.
- Dr. Chester Ho was appointed as the Medical Director for Allied Health in the Community for the Calgary Zone in AHS.

Recruitments

- Dr. Darren Chiu and Dr. Chris Huang joined our section in 2015 as clinical lecturers. Both graduated from the University of Alberta's PM&R residency program in 2015 and are currently in community musculoskeletal and EMG practice.
- Dr. Les LaPlante joined our section in 2015 as Clinical Assistant Professor. Dr. LaPlante graduated from our PM&R residency program and is currently in community musculoskeletal and EMG practice.
- Dr. Serge Mrkobrada also joined our section in 2015 as Clinical Assistant Professor after graduating from our PM&R residency program. He is currently in community EMG practice.

Education

- Postgraduate medical education training – there are 10 residents in the PM&R program. We filled two first-year positions from the CaRMS match.
- Both graduating residents (Dr. Daniel Miller and Dr. Janet Tapper) passed the Royal College exams, maintaining the 100 per cent pass rate for the PM&R residency program.
- Dr. Noorshina Virani developed a spine education program in conjunction with the South Calgary Primary Care Network. This program provides ongoing education for primary care providers for spine care. (See program update on Page 61.)
- Drs. Sean Dukelow, Chester Ho and Ken Lam sponsored the "Functional Electrical Stimulation Advanced Course – Use in Stroke and Spinal Cord Injury Rehabilitation" at the Carewest Dr. Vernon Fanning Centre on March 5-6, 2016. This course brought in international experts in functional electrical stimulation in order to provide training for rehabilitation therapists in Southern Alberta. It was supported by the Alberta Paraplegic Foundation and the AHS President's Excellence Award.
- Dr. Chester Ho organized the "Functional Electrical Stimulation for Wound Healing" course at the University of Calgary on Feb. 21, 2016. This course provided training for treatment to be implemented by wound care providers in Calgary. It was funded by the HBI NeuroTeam in Spinal Cord/Nerve Injury & Pain.

Research

- After receiving visits and demonstrations from two exoskeleton manufacturers, the Ekso Robotics exoskeleton was selected for use in a clinical trial: Exoskeleton Use in Acute Rehab Post Spinal Cord Injury. Dr. Chester Ho is leading the study, which has support from Calgary Health Trust, the Cumming School of Medicine, the Hotchkiss Brain Institute, and the Alberta Paraplegic Foundation. The study is looking at the association between the use of wearable exoskeleton walking technology during the acute phase of SCI and any adverse effects. It is also collecting preliminary data about early standing and walking following SCI that may lead to further research. (See story, Page 54)
- Two of our section members are co-leads of the Hotchkiss Brain Institute's NeuroTeams: Dr. Chantel Debert (Traumatic Brain Injury) and Dr. Chester Ho (Spinal Cord/Nerve Injury & Pain).

Clinical Care

- The Spinal Cord Injury Acute Care team at Foothills Hospital successfully achieved a historic accreditation—organized jointly by Accreditation Canada and the Rick Hansen Institute. It is one of the first of its kind anywhere in the world and is now being used a blueprint for others. (See story, Page 56).
- The Early Supported Discharge program, for patients with acquired brain injury, saw its first patient enrolled in June 2015. This is an innovative clinical service delivery project that has been modeled after the early supported discharge program for patients with stroke. It has been very well received by both patients and their families, and was awarded a CMO Quality Improvement Award in 2016. (See photo, Page 58).
- A Music Therapy trial was launched by Dr. Stephanie Plamondon on Unit 58 and is currently measuring the benefits for patients with brain injury and stroke. (See story, Page 52).

▲ **Schulich engineering student Uday Karri demonstrates his team's AutoStylus project at the Capstone Design Fair at the Olympic Oval in March 2016. The device, which was the result of collaboration with occupational therapists in the Spinal Cord Injury & Rehabilitation Program, allows high level quadriplegics to operate an iPad.**

ADDING RHYTHM TO REHABILITATION

Project collecting data to measure benefits of music therapy for rehab patients recovering from stroke and brain injury

WHEN MUSIC THERAPIST SAMANTHA HARBER begins her session on Unit 58, a few of the patients are leery. They've been referred to the trial program as part of their rehabilitation from stroke or traumatic injury—and they're invited to sit in a circle and choose an instrument.

One patient refuses the pick from the basket of triangles, maracas or other hand percussion instruments. Another chooses but doesn't want to participate.

Then Harber grabs her guitar and starts singing. The mood immediately lightens and by the end of session everyone is participating.

Dr. Stephanie Plamondon

Their involvement, however, is not mere entertainment or distraction—it is designed to help their individual recoveries.

It's a therapy that physiatrist Dr. Stephanie Plamondon has seen presented at many conferences, including at a World Congress for Neurorehabilitation—where there was an entire symposium on music therapy.

One of the studies presented, she says, demonstrated improved fine motor outcomes.

"People who'd never played the piano before, if they tried to learn to play piano, there was a demonstrated improvement in their fine motor skills in recovery from stroke."

The connection between music and rehabilitation can take many forms, but initially Dr. Plamondon is interested in improving patients' mood and allowing them to have greater success with other physical therapies.

"Music has far fewer potential adverse effects than some medications..."

— Dr. Stephanie Plamondon

"In stroke and brain injuries, there is a correlation between poor outcomes and depression," she says. "So any way we can improve mood should have an impact on their outcomes."

The 20-week program at Foothills Hospital, in collaboration with JB Music Therapy, started in July 2016 and was made possible by a grant from the Canadian Music Therapy Trust Fund and a private donor via the Calgary Health Trust.

"It has been inspiring to observe the measurable changes in well-being during each session," says therapist Harber.

"The connections felt in music translate deeply through the mind and body, allowing patients to work physically and emotionally with the therapist."

As more and more research into the therapy demonstrates its value, Dr. Plamondon hopes funding will allow the program at Unit 58 to continue next year.

"In children it's used all the time, but in adults you hardly ever see it being used in therapies," says the DCNS physiatrist.

▲ **Music therapist Samantha Harber gets patients involved in a group session at Foothills Hospital.**

"There's been lots of other research looking at how music therapy can be beneficial in mood, pain and addictions. It has a broad range of potential applications."

It's also been adopted in the evidence-based guidelines for stroke rehabilitation to improve expressive aphasia.

Initial results from the quality improvement project at Foothills are encouraging she says.

"Anecdotal feedback from patients and recreation therapists who have been organizing it has been very positive."

And unlike other therapies, the risks from a patient refusing to shake a maraca are easily mitigated.

"Music has far fewer potential adverse effects than some medications would, so I think it's another tool that we could be using."

▲ **Music therapy intern Kaylyn Légaré, right, helps Samantha Harber engage the group.**

Exoskeleton study gets patients walking after spinal cord injury

Story by Colin Zak

RESEARCHERS AT FOOTHILLS MEDICAL CENTRE (FMC) are the first in Canada to examine the benefits of using an exoskeleton robotic device to rehabilitate patients with spinal cord injuries (SCI) in the days and weeks following their injury.

While previous studies have examined the benefits of using exoskeletons months or years after an SCI, this is the first study to look at the benefits so early during recovery.

This project involves researchers from the Department of Clinical Neurosciences at FMC and the Cumming School of Medicine's Hotchkiss Brain Institute (HBI).

"The first nine months after a spinal cord injury are pivotal to recovery, so we want to attempt to introduce rehabilitation and mobilization early on and see if it makes a difference," says lead investigator Dr. Chester Ho, Head of Physical Medicine and Rehabilitation at FMC and co-leader of the Spinal Cord/Nerve Injury & Pain NeuroTeam at HBI.

The device, known as the Ekso Bionic Exoskeleton, consists of a metal frame that supports and stabilizes a patient's torso, core, legs and feet. It is moved robotically by a therapist, enabling patients with a spinal cord injury to get up and walk around. Although it is controlled by remote control, the device offers varying levels of physical control by the patient, depending on the nature and extent of their injury.

Dr. Ho says exoskeletons may potentially promote recovery and reduce complications in SCI patients by reducing loss of bone and muscle mass caused by spending so much time lying down, and also improve breathing and bowel function. "When it comes to rehabilitation, we often tell people, 'If you don't use it, you lose it,' " says Dr. Ho.

Exoskeletons have typically been used in rehabilitation months after an SCI because patients may have other medical conditions or complications shortly after their SCI, or may experience rapidly dropping blood pressure when they stand up. However, Dr. Ho says the device may be appropriate earlier in the recovery of some patients. "We believe that taking advantage of exoskeletons early will give many patients the best possible chance at recovery," he says.

The year-long study, which began in summer 2016, will include between five and 10 patients selected from across Calgary. It aims to examine whether treatment is safe and feasible in the days and weeks after an SCI. This study will be followed by larger studies involving more patients.

Participants in the study will receive 60-minute therapy sessions with the exoskeleton device two to three times a week, for a total of 25 training hours over an eight- to 10-week period. Safety and feasibility outcomes will be monitored and tracked by the research team throughout all sessions.

Before the advent of exoskeletons, rehabilitation for patients with an SCI required them to be hoisted with a physical therapist moving their legs.

"The exoskeleton lets patients take actual steps, which is not only more realistic but much less cumbersome," says physical therapist Kyle McIntosh.

Alex, 15, sustained a spinal cord injury while tobogganing in December 2015. He says rehabilitation sessions with the exoskeleton have made a difference in how he feels and gives him hope for the future.

"It was amazing to be walking again," Alex says. "It really did a lot for my mental and emotional well-being, not to mention the huge health benefit of being vertical. I remember the first time standing up. Kyle said, 'Wow, now we can see how tall you are.' This gave me something fun and exciting to look forward to every week in a time when I was dealing with a great deal of loss."

This study is funded by the University of Calgary's Hotchkiss Brain Institute through a gift from FirstEnergy Capital Corporation, Alberta Paraplegic Foundation and Calgary Health Trust, with support from the Department of Allied Health at FMC.

Physical Therapist Kyle McIntosh, right, and Olivia Dong, Clinical Leader, Physical Therapy, assist Alex, who recently suffered a spinal cord injury, as he stands up and walks in the exoskeleton.

▲ **The SCI team celebrates their accreditation success at an event on Unit 58 on Oct. 3, 2016.**

Spinal cord team celebrates accreditation

IT WAS A LONG, TIME-CONSUMING PROCESS, but the spinal cord injury acute care team at Foothills Hospital is all smiles after successfully achieving a historic accreditation award.

The honour, developed jointly by Accreditation Canada and the Rick Hansen Institute, is one of the first of its kind anywhere in the world—and is now being used as a blueprint for others.

Dr. Chester Ho, Section Head of Physical Medicine and Rehabilitation, noted the achievement was a result of an amazing effort between front-line staff, management, and all the team members. And he singled out the Rick Hansen Institute for their leadership.

“They really were an advocate for this process. It was through their advocacy and their strong work with Accreditation Canada that this happened!”

Cathy Edmond, Executive Director of Clinical Neurosciences and Medicine at Foothills Medical Centre, acknowledged the passion and dedication within the spinal cord injury team.

“We are so fortunate. We’re so very proud. The collaborative work that everyone does is incredible.“

But she also noted the accreditation process is just the beginning and to sustain the success they must carry on with continuous improvement.

Rick Hansen Institute CEO Bill Barrable, who flew in to Calgary for the celebration at Foothills, said that similar standards to the ones adopted in Calgary are now being used in Beijing, China.

“You’re one of the very first sites in the country and the world to adopt acute care spinal cord injury standards. We’re the only country in the world that has them!”

Amputee Rehabilitation Program

Program Lead: Dr. Kenneth Lam

Overview

Dr. Kenneth Lam

The Amputee Rehabilitation Program provides comprehensive care to patients with limb loss across the continuum of care. Both inpatient and outpatient services are provided. In 2015, over 100 new patients with limb loss entered the program. Amputation occurs at all hospital sites so peri-amputation consultative services are provided city-wide. One of the key components of this program is to optimize the timing and level of amputation by close partnership with our surgical colleagues.

Highlights

The Amputee program is actively involved in limb loss prevention by partnering with multiple stakeholders including the Diabetes Strategic Clinical Network and the PLC Limb Salvage Program.

Out-patient rehabilitation is organized through the Community Accessible Rehabilitation (CAR) Program. With close partnership with the CAR Program we have garnered expertise in managing complex amputees. Those with hemi-pelvectomies and high above knee amputation are receiving the latest prosthetic components like microprocessor knee and novel socket designs.

Through a generous grant from the Chief Medical Officer, a Vascular Amputation Management Pathway has been developed for the Peter Lougheed Hospital Vascular unit. We have also developed a new patient teaching booklet.

Education

The program is dedicated to medical education and training. Physiatry residents complete a mandatory three-month period in the program during their residency. The program is also involved in the education and certification of prosthetists in training. In-service lectures are also delivered to Allied Health and nursing staff on a regular basis.

Members

Dr. Kenneth Kui Sai Lam
Dr. Gentson Leung

The Burn Rehabilitation Program

Program Lead: Dr. Vincent Gabriel

Overview

Dr. Vincent Gabriel

The Burn Rehabilitation Program continued to expand yet again this year with a renovation of the outpatient burn and wound care treatment areas.

In conjunction with Alberta Health Services, we have been undergoing a quality improvement project to streamline our clinic processes. Students from disciplines including Allied Health, Medicine, and Veterinary Medicine regularly attend our clinics for learning experiences.

Our research program has also continued to grow, including receiving accolades for our team such as a “top 10 most influential publications of the year” recognition from the American Burn Association.

We continue to work closely with the Calgary Firefighter’s Burn Treatment Society, both on our research endeavours, but also on community outreach including our burn survivor support program.

The Calgary Brain Injury Program

Program Lead: Dr. Christine McGovern

Overview

Dr. Christine McGovern

The Calgary Brain Injury Program addresses the rehabilitation needs of individuals with acquired brain injuries (ABI) which may arise from: trauma, infection, aneurysm rupture, hypoxia, hydrocephalus, or other causes. The affected individuals cross the spectrum from mild to severe levels of injury.

A highlight this year includes the start of an Early Supported Discharge Program, where people discharged from hospital can receive interdisciplinary rehabilitation within their homes and community. This service allows them to leave hospital earlier and apply their rehabilitation to practical goals that are immediately relevant to the affected individual and their family. This is currently being studied with a research grant entitled "Home Sweet Home: Early Supported Discharge in Traumatic Brain Injury". There were 28 individuals who participated in this program this year.

We have also started a pilot project involving music therapy on the neurorehabilitation unit and plan to complete the evaluation of the project this coming year.

Another success is that there is now a "Coping With Concussion" education class that people in the community can self-refer to through Alberta Healthy Living. The content was developed for people who are continuing to experience concussion symptoms more than three months after their injury.

Service

The service includes both an inpatient and an outpatient component.

The inpatient service includes a physiatry consultation service for individuals in acute care, as well as 15 inpatient beds on a tertiary neurorehabilitation unit at Foothills Hospital. The INTENZ program has been well received and continues to run. It was developed to increase the amount of rehabilitation services delivered to our neurorehabilitation inpatients, and involves therapy assistants practicing skills with the patients during evenings and weekends, when traditionally less therapy has been delivered. The Cuming & Gillespie patient experience team continues to support SynAPSE (SYNcing ABI Peer Support & Education), a one-on-one peer support program available on the neurorehabilitation unit. There is also a facilitated group meeting monthly for individuals, as well as their families, to provide an opportunity for connection and support. Individuals appropriate for the early supported discharge program are identified and referred prior to discharge from hospital.

▲ **Manager Jason Knox, left, and physiatrist Dr. Chantel Debert celebrate the "Home Sweet Home" study, which was recognized with a CMO Quality Improvement Award.**

The outpatient service is based upon a centralized referral system which provides triage and advice from our community case manager for access to several different services, including:

- Acute concussion education sessions delivered approximately every two weeks which consist of symptom management advice in a group format to individuals affected by concussion within three months of injury.
- A Brain Injury Rehabilitation Clinic which provides assessment and treatment by physiatrists (specialists in Physical Medicine and Rehabilitation). We also have social workers associated with our clinic.
- Liaising with the Community Accessible Rehabilitation (CAR) program in order to arrange interdisciplinary rehabilitation for individuals as required.
- Contracting for services with the Association for Rehabilitation of the Brain Injured (ARBI), a community based program, to provide rehabilitation services for appropriate individuals.

We have continued to see a steady increase in referral volumes over time, with 1,785 outpatient referrals received this past year.

Education

We continue to be actively involved in teaching at many different levels. We have medical students and residents, Allied Health students, and nursing students learning at various locations within the program. Two of the residents presented posters at the Canadian Association of Physical Medicine and Rehabilitation this year.

"Feed Your Brain" is a series of lunchtime sessions we hosted on topics of interest to service providers. These run from Foothills Medical Centre and are shared via telehealth.

Grants and Research

Grants have been received from various agencies and are supporting research projects in concussion, biomarkers, growth hormone deficiency, and effectiveness of rehabilitation. New grants this year totaled $267,500. We are in the process of setting up a database for our traumatic brain injury population.

Members

Managers: Jason Knox, Lisa Patel, Shauna Brady

Community Case Manager: Heather Murison

Inpatient Brain Injury Co-ordinator: Jill Congram

Physiatrists: Dr. Christine McGovern, Dr. Rodney Li Pi Shan, Dr. Chantel Debert, Dr. Christopher Grant

Psychiatrist: Dr. Jeremy Quickfall

Clinic Social Workers: Carol Lawson, Valerie Bunz

Neuropsychologists: Stewart Longman, Amy Siegenthaler, Ashley Fischer

Administration Support: Kendra McDonald, Susan Morson, Ashley Derksen

Pediatric and Young Adult Rehabilitation Medicine

Program Lead: Dr. Lee Burkholder

Overview

The program provides inpatient and outpatient rehabilitation medicine services at the Alberta Children's Hospital (ACH) to pediatric populations, including children with neurological disorders such as brain injury, cerebral palsy, myelomeningocele/spinal cord injury, neuromuscular conditions, and other neurodevelopmental disorders as well as musculoskeletal disorders such as limb deficiency.

The program is also responsible for the Young Adult Rehabilitation Clinic, an outpatient clinic at the Sheldon M. Chumir Health Centre dedicated to adult patients with child-onset neurological and musculoskeletal conditions, which provides comprehensive rehabilitation medicine management and assists patients transitioning from pediatric care to the adult world.

Dr. Lee Burkholder

Highlights

The Pediatric and Young Adult Rehabilitation Medicine Program continues to provide leadership and assist in the development of various interdisciplinary rehabilitation services through the Vi Riddell Children's Pain and Rehabilitation Centre at the ACH.

Allied Health Student-Led Pediatric Rehabilitation Programs—programs that utilize cohorts of four to six students—were developed to maximize student learning, enhance clinical service delivery and address extensive waitlists. Programs have been implemented for Occupational Therapy (OT), Physiotherapy and Child Life at ACH. To highlight the early success of these programs, the OT program has provided 133 patient consultations and episodes of care, effectively eliminating an approximate one-year waitlist for OT services, and provided novel group rehabilitation programs for 129 children.

The Youth Driving Assessment and Training Program was officially launched this past year to offer pre-driving skills assessment and development as well as driver simulation training to adolescents with disabilities. This new program is in collaboration with the adult-focused Community Accessible Rehabilitation Pre-Driving Assessment Service at the Sheldon M. Chumir Health Centre. Utilizing technologies that assess visual and motor skills, ACH occupational therapists evaluate adolescents for driving readiness. Following evaluation, they then assist participants with compensation techniques and interventions required to address impairments. After working on building skills, participants then can access the driving simulator for further virtual training. The program also facilitates communication to Driver Fitness and Monitoring regarding individual driver potential and safety.

Clinical Care Updates

The Pediatric Rehabilitation Medicine inpatient consultation service assessed and treated 55 patients, within the context of the ACH interdisciplinary neuro-rehabilitation team, while patients were admitted to hospital. An additional 14 patients were followed during admission to the ACH Dr. Gordon Townsend School (GTS) Rehabilitation and Education Program for management of medical and rehabilitation issues. The program also provided 572 pediatric outpatient consultation and followup appointments through various ACH rehabilitation clinics. A further 286 outpatient appointments were attended by adult patients through the Young Adult Rehabilitation Clinic. The program continued as a significant contributor to the interdisciplinary ACH Spasticity Assessment Program (SAP), which provides consultation to children with complex hypertonicity issues for comprehensive assessment and management recommendations. The SAP assessed seven children/young adults. Program-led gait analysis for recommendation of therapeutic interventions continued through the C.H. Riddell Movement Assessment Centre at the ACH with 15 patients undergoing evaluation.

Education

Program educational pursuits were largely related to post-graduate medical training. The program had 13 medical post-graduate trainees, including PM&R, Pediatric Neurology and Developmental Pediatric residents, on service for 12 of 13 academic blocks.

Dr. Gnanakumar is a member of the PM&R Residency Training Committee and is the physician lead for PM&R medical student clinical electives. Dr. Burkholder is a member of the Developmental Pediatrics Residency Training Committee.

Future Direction

The program is committed to expanding clinical services to meet the increasing care demands. The program also intends to expand its research endeavours with the addition of a clinician-scientist in the near future. The clinician-scientist will be fully supported to build an original pediatric rehabilitation medicine program in collaboration with established Vi Riddell Children's Pain and Rehabilitation Centre research programs.

Members

Dr. Lee Burkholder
Dr. Vithya Gnanakumar

PM&R Musculoskeletal and Chronic Pain Programs

Program Lead: Dr. Noorshina Virani

Highlights

The Section of PM&R MSK program, the AHS Chronic Pain Program and the South Calgary Primary Care Network (SCPCN) have launched the "Back 2 Health" family physician training program on various aspects of low back pain (LBP) assessment and management of non-surgical cases in the community. We have completed our first series of workshops with primary care practitioners to address:

- Confidence with the neurological exam for LBP
- Myofascial LBP
- Musculoskeletal Pelvic Girdle Pain and Lumbar Facet Syndrome

A workshop survey concluded that primary issues with performing the neurological exam included time to complete, interpretation of findings and confidence in performing the examination.

It is our goal to continue offering these workshops to engage a wider audience of practitioners and to enable them with "new" strategies to address the needs of their patient population. Our secondary objective is to embark on multi-disciplinary patient education in LBP, within the PCN community, and finally to incorporate Choosing Wisely Canada guidelines for efficient use of imaging resources.

PM&R MSK is engaged in the Alberta Bone and Joint Health Strategic Clinical Network (ABJHSCN). The Spine Access Alberta PRIHS three-year grants ($750 000 grant with completion in March 2017) have established three Alberta community clinics for spine triage and assessment. These are located in Foothills Primary Care (Cochrane, AB), Strathcona Community Hospital (Edmonton Zone) and Fort McMurray. Ultimately, the goal is to expand the scope of these clinics and develop a sustainable provincial funding model for spine triage and assessment.

CONTINUED ON PAGE 62

CONTINUED FROM PAGE 61

An interdisciplinary FMC Spine Triage Clinic was also established in October 2015 between neurosurgical spine surgeons and MSK physiatry. Five physiatrists are involved with patient assessment and further management if required. This initiative has enhanced delivery of service and reduced wait times for assessment substantially—in the order of weeks. Patients and their physicians receive a non-surgical management plan for their back pain, when surgery is not required.

Performing Arts Medicine continues to evolve with new leadership at the Alberta Ballet. Dr. Arun Gupta continues to provide specialty consultation. The goal is to establish a High Performance Multidisciplinary Centre with an emphasis on wellness and injury prevention in this elite athlete population.

Musculoskeletal Physiatry continues to grow in Calgary. We welcomed new physiatrists Dr. Darren Chiu (UofA), Dr. Chris Huang (UofS), and Dr. Les LaPlante (UofC), who all have interests in musculoskeletal and electrodiagnostic medicine in addition to ultrasound-guided interventional procedures. They have joined Drs. Tulsi and Raugust at Kinesis community practice. Dr. Serge Mrkobrada (UofC), also began practice at Southland EMG last year.

Research Awards

- Mitacs-Accelerate – OTP PDF Award ($110,000). Whitten T (PDF), Benson BW (Co-Supervisor), Dukelow S (Co-Supervisor). Quantifying Visual Impairments using Robotics following Sport-Related Concussion (2016 - 2018).
- Alberta Innovates Health Solutions Clinical Researcher-Clinician Fellowship ($165,000). Mang C (PDF), Dukelow S (Co-Supervisor), Benson BW (Co-Supervisor). Department of Clinical Neurosciences, Cumming School of Medicine, University of Calgary. January 2016 – August 2019. Project Title: Robotic Assessment of Sensorimotor Control Following Sport-related Concussion: Implications for Return-to-play.
- Hotchkiss Brain Institute Research Award ($100,000). Debert C, Benson B, Dukelow S, Yeates K, Goodyear B. Biomarkers, Robotics and Innovative Neuroimaging (BRAIN) in Sport Concussion. August 2015 – 2017.

Chronic Pain Program

Two physiatrists (Drs. Virani and Dike), practice at the Chronic Pain Centre (CPC) on the neuromusculoskeletal team. Last year, the CPC transitioned to a one-year, time-limited model of patient care for most patients. Fibrofocus, a pilot program for the assessment and management of those with fibromyalgia, was introduced as a 14-week program of self-management education and treatment. The hope is to disseminate this model widely into the patient's medical home. Referrals to CPC continue to escalate with 2,295 admitted and 2,650 discharged (with the new time-limited program) at the end of 2015. The CPC is a mandatory rotation for Family Medicine and Physiatry residents. The program sees an increasing number of learners, at all levels, with 199 such learners participating in clinical care in the past year, compared to 161 in 2013/2014.

Members

AHS Chronic Pain Centre (AHS CPC):
Nwamara Dike
Noorshina Virani

Performing Arts Medicine (PAM):
Arun Gupta
Chester Ho

Community Practitioners:
Maryana Apel
Darren Chiu
David Flaschner
Tony Giantomaso
Arun Gupta
Chris Huang
Les LaPlante
Daniel LeBlond
Serge Mrkobrada
Jordan Raugust
Vishal Tulsi

The Spinal Cord Injury Rehabilitation Program

Program Lead: Dr. Chester Ho

Overview

The Spinal Cord Injury (SCI) Rehabilitation Program provides inpatient and outpatient rehabilitation services to persons with traumatic and non-traumatic SCI for southern Alberta, eastern British Columbia and western Saskatchewan.

During 2015-16, the SCI Rehabilitation Program focused on the enhanced collaboration with community partners, knowledge translation activities as well as the development of a provincial SCI registry which includes both traumatic and non-traumatic SCI.

Highlights

The SCI program admitted 47 persons for acute inpatient rehabilitation.

There were 764 outpatient visits in the SCI Physical Medicine & Rehabilitation Clinic between September 2015 and September 2016.

The diaphragm pacer system was implanted on a second patient at the Foothills Medical Centre in 2015. This allowed its recipient to avoid being mechanically ventilated and to continue to live in the group home of her choice.

The Functional Electrical Stimulation (FES) Cycling program evaluated 60 new users between September 2015 and September 2016. Altogether, between the three sites (Foothills Hospital, University of Calgary Faculty of Kinesiology, and Spinal Cord Injury Alberta), just under 1,400 training sessions were provided. Mount Royal University will become the fourth site in Calgary for this program as it just received funding from the Craig H. Neilsen Foundation for the purchase of the FES bicycle. It is anticipated it will be installed at Mount Royal University in 2017.

The exoskeleton research program was started in June 2016 after obtaining ethics approval from the University of Calgary. The main outcome is to measure the safety and feasibility on its use in persons for gait training shortly after an acute spinal cord injury. So far, five participants have been recruited into the study and recruitment is anticipated to be completed by 2017. This program has been funded by the Alberta Paraplegic Foundation, Calgary Health Trust, Cumming School of Medicine and Hotchkiss Brain Institute.

The provincial SCI registry project entered its second year in 2016. The main goals of this project include the development of a non-traumatic SCI registry and a redesign of the community long-term followup for persons with SCI. Collaboration with researchers from the University of Toronto, Alberta Health, and AHS Analytics generated an algorithm to identify persons with SCI using administrative data. Dr. Chester Ho presented the algorithm and the validation study results together with the Toronto team at the International Spinal Cord Injury Society meeting in Vienna, Austria, in September 2016. This study has been funded by Brain Canada, with support from the Alberta Paraplegic Foundation, Rick Hansen Institute, University of Alberta Institute Neuroscience & Mental Health Institute, and the University of Calgary's Hotchkiss Brain Institute.

The SCI acute and rehabilitation units went through a very successful Accreditation Canada survey for SCI in 2016. It is the first time that the SCI program in Calgary gained accreditation status, and the first time that any acute SCI unit in Canada was awarded accreditation status in SCI.

Through the support of Campus Alberta Neuroscience and the Rick Hansen Institute, the SCI leadership team in Calgary is working with the SCI leadership team from the Glenrose Rehabilitation Hospital and the University of Alberta in Edmonton—as well as provincial SCI stakeholders such as Spinal Cord Injury Alberta and the Alberta Paraplegic Foundation—to develop a Provincial Spinal Cord Injury Strategy. The aim is to complete this by 2017.

Members

Dr. Denise Hill
Dr. Chester Ho
Dr. Dan McGowan
Raj Parmar (Clinical Nurse Specialist)

The Stroke Rehabilitation Program

Program Lead: Dr. Sean Dukelow

Overview

Physiatry provides support for inpatient stroke rehabilitation services at both the Foothills Medical Centre and the Dr. Vernon Fanning Care Centre. Our physiatry group also supports outpatient stroke rehabilitation in the community for patients involved with Community Accessible Rehabilitation (CAR), Early Supported Discharge (ESD), Association for Rehabilitation of the Brain Injured (ARBI), and other private rehabilitation facilities. We accept referrals from across southern Alberta for patients who require stroke rehabilitation expertise.

Highlights

Clinical highlights involved a Stroke Rehabilitation Summit in May 2016. The Summit was funded by a grant from Alberta Innovates Health Solutions, the Department of Clinical Neurosciences and the stroke physiatrists. This meeting brought together 105 individuals involved in the front-line rehabilitation care of stroke survivors, managers and patient advocates to discuss the current state of stroke rehabilitation in Calgary and to begin the process of strategic planning for our stroke rehabilitation team.

Education

Several physiatry residents, neurology residents, acute stroke fellows, and medical students spent time learning about stroke rehabilitation in our clinics, on the ward and in classroom teaching sessions.

Research

Members of the Stroke Rehabilitation Program published eight papers last year. Our team participated in the EVREST multi-centre study, examining virtual reality as a rehabilitation technique and the results were published in Lancet Neurology.

Dr. Dukelow's RESTART project, which involves tracking stroke recovery using robotics, won paper of the year at the annual Canadian Association of Physical Medicine and Rehabilitation Meeting.

Members

Dr. Sean Dukelow
Dr. Ken Lam
Dr. Steve McNeil
Dr. Gentson Leung
Dr. Christopher Grant

General Physical Medicine and Rehabilitation

Overview

General Physical Medicine and Rehabilitation (PM&R) patients are seen in the Outpatient Physiatry clinic area on the main floor of the Special Services Building at Foothills Medical Centre. Various physiatrists and senior physiatry residents provide consultation and physician followup services to these patients.

General PM&R is not a formal multidisciplinary program at this time. The types of patients seen may include adults with non-surgical rehabilitation needs secondary to inflammatory and degenerative arthritis, scoliosis, myofascial pain, spine and peripheral joint pain, orthopedic trauma, tendinopathy, metabolic bone disease, cerebral palsy, neurological and musculoskeletal complications of HIV or cancer, and some movement disorders.

Three physiatrists continue to provide outpatient consultation service to the subspecialty Neuromuscular, Amyotrophic Lateral Sclerosis, and Multiple Sclerosis multidisciplinary clinics at the South Health Campus, as well as Inpatient General Physiatry consultations.

Inpatient General Physiatry consultation is provided at Rockyview General Hospital and Carewest Glenmore Park on a weekly basis by Dr. Gentson Leung. At the Foothills Medical Centre, Inpatient General Neurological rehabilitation consultation is currently provided by a rotating physiatrist on service for patient populations including but not limited to multiple sclerosis, neuromuscular disease, cerebral palsy, and some cancer patients, as well as subspecialty Physiatry spasticity inpatient consultations.

Physiatrists in the General Physiatry clinics have expertise in the use of ultrasound for visualization of nerve and musculoskeletal structures, and for guided injections. This innovative technology has moved to the forefront in Physiatry education and clinical practice, especially in the areas of musculoskeletal medicine, neuromuscular disease and spasticity management.

The Section of Translational Neuroscience

Section Head: Dr. V. Wee Yong

THE SECTION OF TRANSLATIONAL NEUROSCIENCE (STN) in the Department of Clinical Neurosciences (DCNS) consists of five primary members distinguished by their PhD background. Research areas include neurodegenerative diseases, movement disorders and multiple sclerosis (MS), with a focus on understanding the pathogenesis of neurological disorders and the discovery and translation of new therapies into the clinic. These therapies include those that may protect the injured nervous system, and those to promote regeneration.

All members within STN maintain meaningful and productive collaborations with clinicians or clinician scientists within DCNS, in addition to our partners in the Hotchkiss Brain Institute (HBI), the University of Calgary and Alberta Health Services.

Current active members of STN include:

- **Dr. V. Wee Yong** is a professor who co-directs the MS Program of HBI. He holds the Canada Research Chair in Neuroimmunology (Tier 1) and he has been the president of the International Society of Neuroimmunology. Dr. Yong's research interests lie in the area of neuroimmunology, neuroprotection and CNS regeneration. His projects have been guided by MS, spinal cord injury and malignant gliomas. Dr. Yong's research has been translated into Phase III clinical trials in MS and spinal cord injury. He is an elected fellow of the Royal Society of Canada and the Canadian Academy of Health Sciences. His research, cited over 15,000 times (Web of Science) has been supported by Canadian Institutes for Health Research (CIHR), the MS Society of Canada, and Alberta Innovates - Health Solutions (AIHS).
- **Dr. Minh Dang Nguyen** is an associate professor and a member of the HBI. The main goal of his research is to understand the roles of the cytoskeleton, the physical backbone that maintains the architecture of the cell, in neurological diseases. His research has been funded by AIHS, Alberta Cancer Foundation, CIHR, the Human Frontier Science Program Organization, the Brenda Strafford Foundation Chair in Alzheimer research, the Amyotrophic Lateral Sclerosis Association and the Austrian Academy of Sciences.
- **Dr. Shalina Ousman** is an associate professor and a member of the MS Program of HBI. Her research is focused on investigating the role of alphaB-crystallin (αBC) in autoimmune function, disease mechanism and regeneration in the context of multiple sclerosis. Dr. Ousman also has a strong program to foster axonal regeneration in the peripheral nervous system. Her research has been funded by CIHR, AIHS, Multiple Sclerosis Society of Canada and Canadian Foundation for Innovation.
- **Dr. Bin Hu** is a professor specializing in Parkinson's disease research. He is a member of HBI, he directs a basic research laboratory and he oversees an experimental therapeutic program for patients living with Parkinson's disease. His scholarly activities and research interests are focused on brain attention networks, especially those related to sensorimotor learning and memory. His research has been supported by CIHR, Parkinson Society Alberta, AIHS and Branch-out Foundation for Neurological Diseases.
- **Dr. Oury Monchi**, is a professor, Clinical Research Director of DCNS, the Research Director of the Movement Disorders Program of HBI, and the Tourmaline Oil Chair in Parkinson's disease. He was, until September 2014, the founding director of the Quebec Parkinson Network. His laboratory has been a pioneer in using different neuroimaging techniques to study the origins and evolution of cognitive deficits in Parkinson's disease with the ultimate goal of the early prediction of dementia in the disease. Interactions between cognitive and neuropsychiatric symptoms, and non-medication therapies such as transcranial magnetic stimulation and cognitive training are also being explored. Dr. Monchi is the Canada Research Chair (Tier 1) in non-motor symptoms of Parkinson's disease. His research is funded by CIHR, NSERC, and Parkinson Society Canada.

Highlights

As the director of the Alberta MS Network, Dr. Yong collaborated with non-governmental organizations, industry and the Alberta government to successfully bring new research funding for MS into Alberta. In the last year, he organized the inaugural Americas School of Neuroimmunology (attended by 150 delegates from the Americas in Calgary), and he co-organized the inaugural Global Schools of Neuroimmunology in Jerusalem (attended by over 500 trainees and investigators).

Dr. Nguyen co-ordinated the Principles of Neuroscience I graduate course for the Department of Neuroscience in 2015 and 2016. He was a conference speaker and chair at the Spring Hippocampal Research Conference in Sicily, Italy.

Dr. Ousman successfully graduated a PhD candidate in the past year and has two other PhD students who are scheduled to defend their thesis work shortly. She organized a symposium on neuroimmunology at the 2016 Canadian Association for Neuroscience annual meeting in Toronto. Dr. Ousman was recognized as an Immigrant Women of Inspiration by the Canadian Immigrant Magazine in 2016.

Dr. Hu continues to direct a $750,000 grant that oversees a multi-centre study of Ambulosono, a sensorimotor contingency-based music walking program for people living with Parkinson's disease. His work has been widely publicized, including by the press in the United Kingdom.

Dr. Monchi received a JELF fund from the CFI to establish his laboratory with a main focus on TMS and neuroimaging in movement disorders and dementia. He was a speaker at major symposia on Parkinson's disease in Barcelona, Milan and Palo Alto, Calif., in the past year.

Dr. Manuel Hulliger has received Professor Emeritus status from the University of Calgary—congratulations!

Education

STN members offer graduate, postdoctoral and clinical fellowship studies in both clinical and basic neurosciences, year-round research projects for senior undergraduates and summer research programs. Section members are also active participants in community-oriented educational events.

Future Directions

The Section of Translational Neuroscience is in a unique position to foster cutting edge translational neuroscience research. We are somewhat different from the basic science departments in that our program has a clear mandate to facilitate and integrate research and education and to ensure that discoveries in basic and clinical research can lead to innovative health solutions for Canadians with neurological and mental disorders. In that light, work by our STN members, in collaboration with our neurology and neurosurgery colleagues, has resulted in a recently completed and successful Phase III clinical trial in MS, and an ongoing Phase III trial in traumatic spinal cord injury. A $5 million team grant from Alberta Innovates – Health Solutions led by one of our STN members, and which includes several clinical colleagues, has enabled us to initiate and continue clinical trials of potential remyelinating therapies in MS.

Researchers discover ‘quiet’ cells waiting to be woken up by the brain

Story by Kristy Cross

WHAT STARTED AS A PROJECT INVESTIGATING the role of memories in Parkinson’s disease patients took Clinical Neuroscience researchers Dr. Bin Hu and Taylor Chomiak down a ten-year path towards what Dr. Hu calls the most significant discovery in his career.

And it has nothing to do with Parkinson’s disease.

Their discovery, which was published in the flagship journal BMC BIOLOGY, is the first to explore a cellular mechanism by which the brain deactivates a group of neurons and then gradually reactivates them when the time is right.

Dr. Hu, a professor in the Section of Translational Neuroscience, and Clinical Assistant Professor Chomiak, began their work looking at a region of the brain that is responsible for learning and memory and is known to be implicated in Parkinson’s disease. The region is called the temporal association cortex (TeA) and one day Chomiak was looking at some neurons from young rats when he saw something unusual.

“Really the cells were just very quiet. Boring even,” says Chomiak. “So I continued on with my other experiments and assumed it was maybe a technical limitation, or a different type of cell that we were seeing.”

However hard he tried to ignore it, though, the phenomenon persisted. The researchers moved labs, changed equipment, and still there was this quiet group of cells sitting in the periphery that they just couldn’t explain.

“Finally I couldn’t ignore it anymore – it became so profound and was so robust that we decided it was time to figure out what was going on.”

In the context of learning and memory, there are several models to explain how the brain develops.

One of the models that is supported by experimental data states that there is a hierarchical mechanism of maturation—in essence, basic functions, such as vision, develop first and once those foundations are fully established, then the more complex functions such as learning and long term memory follow.

Starting small, the brain gradually builds on itself and increases in complexity as it grows and develops. Dr. Hu thinks this makes sense when you think about language acquisition in children, or infantile amnesia—the inability to remember things that happened to us when we were babies.

He explains, “As infants, we don’t have the cognitive ability to correctly understand and judge the context for our experiences, so there are no evolutionary benefits for us to store them in our long term memory.”

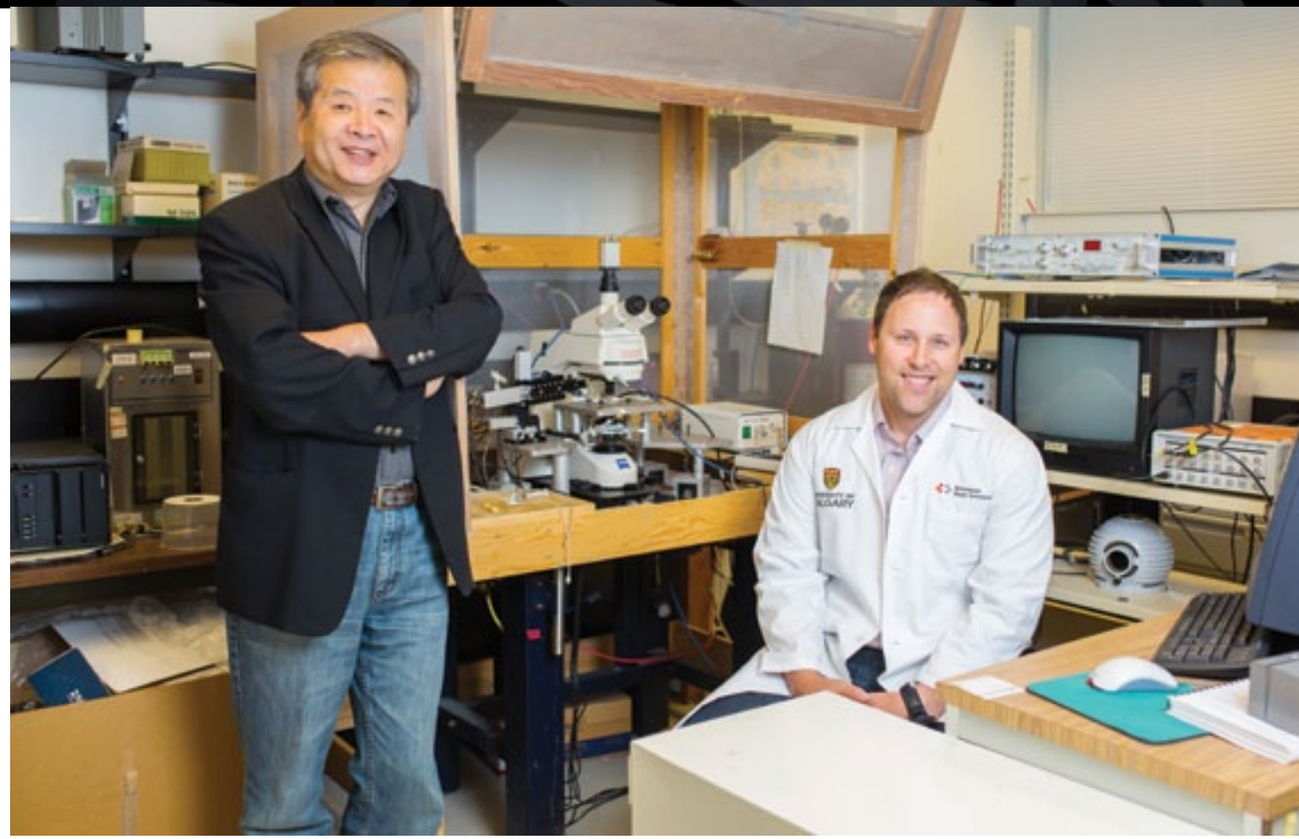
Previous research has shown on a macroscopic level that there are changes going on in the TeA as the brain develops. For example, MRI data has been able to show that there are changes in activity in the TeA at different points in neural development. Until now, however, nobody has looked at what’s going on at the cellular level.

“We are exploring this for the first time, showing that there are neurons in the brain that are present at birth, but remain dormant and are slowly activated as the brain matures,” says Dr. Hu.

Their work challenges the dogma that all neurons in the brain are present and fully active from birth.

Normally, information comes into the dendrites of a neuron and converges in the soma, or cell body. The soma then integrates all of this information and sends it down the axon, where it goes out to be picked up by the dendrites of other neurons.

What Dr. Hu and Chomiak have discovered is that there is a temporary lipid and protein layer that exists between the dendrites and the soma in neurons located in the TeA. “The cell is still there and it’s fully intact, but it is functionally disconnected,” explains Chomiak. “The message comes in to the dendrites, but then it hits the barrier and can’t be passed on to the other cells in the network.”



▲ **Dr. Bin Hu, left, and Taylor Chomiak discovered “dormant” cells — intact but disconnected.**
Photo by Adrian Shellard

Over time, the barrier gradually disappears and slowly the cells ‘wake up’ and begin communicating with one another. The scientists believe it is at this point that long-term memories start to form.

Dr. Hu and Chomiak believe that this discovery is important for understanding how we learn and that it might have implications for certain neurodevelopmental disorders. They have started to look at what might be facilitating the decoupling and whether or not it can be manipulated.

When they added a growth factor that is known to be important in normal neurodevelopment, the scientists found that they could wake these cells up prematurely.

“This has led us to ask all kinds of new questions,” says Chomiak. “Clearly this growth factor is important, so now we want to know how it is regulated and how or if it might be signalling this decoupling process.”

The researchers have also observed certain neurodevelopmental disorders where there is an abnormal level of activity in this brain region at certain times.

“I think that this mechanism could be related to certain disorders where we have observed cells in the TeA coming online either too early, or too late,” says Chomiak.

“There seems to be a window of time for normal neurodevelopment and, if we can understand this mechanism, I believe it could lead to interventions that could normalize these abnormal growth trajectories.”

Undergraduate Medical Education in Clinical Neurosciences

Co-Chairs: Dr. Gary Klein and Dr. Darren Burback
Evaluation Co-ordinator: Dr. Scott Jarvis
Anatomy Co-ordinator: Heather Jamniczky PhD
Course Co-ordinator: Kelsey O'Donnell

Overview

Medical students learn about neurosciences and aging during August and September each year, in the first course of the second year of the undergraduate curriculum. The neurosciences component is combined with content from geriatrics, otolaryngology, ophthalmology, pain and palliative care.

The course, entitled, Course V – Neurosciences, Aging and Special Senses, is overseen by the Undergraduate Medical Education office of the Cumming School of Medicine at the University of Calgary.

The neurosciences content in the course begins with a series of lectures on the functional anatomy and physiology required to evaluate patients presenting with neurological complaints. The remainder of the content covers clinical presentations of neurological illness as well as sessions devoted to specific neurological conditions. The curriculum is taught by approximately 130 teachers, including 60 from the Department of Clinical Neurosciences.

Course content is delivered via a combination of lectures, patient presentations, small group seminars and bedside teaching sessions. A group of approximately 15 teachers from the department have taken some further faculty development training and have committed to supervising many of the small group and clinical teaching sessions.

Course V Committee:

Dr. Alice Ho
Dr. Gerald Pfeffer
Dr. Dan McGowan
Dr. Darren Burback
Dr. David Patry
Dr. Gary Klein
Dr. Karen Fruetel
Dr. Karen Verstraten
Dr. Jeptha Davenport
Dr. Scott Jarvis
Dr. Paolo Federico
Dr. Paul Marck
Dr. Paula Pearce
Dr. Ron Spice
Dr. Vivian Hill
Dr. Walter Hader
Dr. Heather Jamniczky
Dr. Clare Gallagher
Dr. Lori Montgomery
Dr. Martina Kelly
Mr. Mike Paget
Ms. Kelsey O'Donnell

Resident Research Day

▲ **Resident Research Day winners Dr. Michael Yang, left, and Dr. Joey Grochmal, right, with Clinical Neurosciences Department Head Dr. Rajiv Midha in November 2015.**

DCNS celebrates research excellence

RESIDENTS IN THE Department of Clinical Neurosciences spend much of their time focussed on becoming excellent clinicians.

But research is also a critical part of each of the programs and Resident Research Day allows residents to share their passion with their peers and the rest of the department.

Residents from Neurology, Neurosurgery, Physical Medicine & Rehabilitation and Pediatric Neurology are invited each November to submit abstracts to be judged by a panel of faculty members. The strongest abstracts are selected to be presented in the Coombs Lecture Theatre and the best of the best are chosen for two prestigious awards.

In 2015, the J. Gregory Cairncross Award for Excellence in Clinical Research was awarded to Dr. Michael Yang for his presentation "Video diversion improves success rate of fundoscopic exam in children: a prospective randomized controlled trial."

The Doug W. Zochodne Award for Excellence in Basic Science Research was won by Dr. Joey Grochmal for his research on "Myelin-incorporated solvatochromic dyes can be exploited to probe the biochemical composition of living myelin at high resolution."

The department was thrilled with the calibre of all submissions for Resident Research Day and congratulates Drs. Yang and Grochmal on their successes.

These awards offer a glimpse of the world-class research our residents will continue in their promising careers.

Neurology Residency Program

Program Director: Dr. Michael Yeung
Program Administrator: Elizabeth Martens
Number of positions per year: 3
Accreditation: Royal College of Physicians and Surgeons of Canada
Length of Training: 5 years
Mandatory Research Block: 3-6 months

The University of Calgary Adult Neurology Residency Training Program is dedicated to educating residents in Neurology.

Dr. Michael Yeung

Upon completion of training in Neurology, a resident is expected to be an expert in the prevention, diagnosis, and management of patients with diseases of the nervous system; and to integrate all of the CanMEDS roles (Medical Expert, Communicator, Collaborator, Leader, Health Advocate, Scholar, and Professional) to provide optimal, ethical and patient-centred medical care.

The program facilitates learning through an atmosphere of collegiality and mutual respect that fosters active communication between residents and faculty.

We emphasize the pursuit of excellence in clinical and academic neurology and instill intellectual curiosity of the discipline for the academic leaders of tomorrow.

We strive to create a level of excitement that will stimulate our residents to seek further education and pursue careers in academic and community neurology. Our program aims to serve both the present and future requirements of our patients, communities, and discipline.

Our residents have presented their research at national and international conferences and have been the recipients of grants and scholarships for their clinical and academic pursuits.

The Neurology Residency Training Program at the University of Calgary prepares residents to become specialists in neurology, whether their primary interest is clinical or academic.

The program has trained over 45 neurologists since its inception in 1981; these specialists practice neurology in community and academic institutions throughout the world.

Physical Medicine and Rehabilitation (PM&R) Residency Program

Program Director: Dr. Gentson Leung
Program Administrator: Selena Smith
Number of positions per year: 2
Accreditation: Royal College of Physicians and Surgeons of Canada
Length of Training: 5 years

Within the last academic year, the section supported a total of 10 post-graduate residents in its Royal College accredited Physical Medicine and Rehabilitation training program. In addition, there were 23 off-service and visiting residents from a variety of programs, including neurology, geriatrics, rheumatology, pediatrics, and sports medicine. There were 28 formal electives for medical students, several Med 440 courses and a number of informal shadowing students interested in learning more about our specialty. The interest in Physiatry electives and shadowing opportunities from medical students continues to increase each year, and is reflected in the growing numbers of applicants applying to our program. Last year, over 30 applicants applied for two residency spots, which is by far the most the program has seen.

Dr. Gentson Leung

The Section of Physiatry provides support to the University of Calgary medical school in Course 2 (MSK) and Course 5 (Neuro) teaching for small groups, lectures, and clinical skills. Many of the faculty, as well as residents, participate in providing this education.

The Senior Physiatry Resident clinic occurs one half day per week and provides service to General Physiatry patients (ie. non sub-specialty physiatry patients). Two PM&R residents provide outpatient consultation and followup in this longitudinal clinic while supervised by a staff physiatrist throughout their final year of training. This allows further outpatient clinic exposure, experience in continuity of care, development of managerial and time management skills, opportunity for OSCE examination preparation, teaching medical elective students, and exposure to varied clinical diagnoses that may not be typically seen in the subspecialty clinics and inpatient services.

Trainees also have the unique opportunity in our program to gain exposure to the rehabilitation of patients with burns. Other areas of growth in terms of educational opportunities include rehabilitation of critically ill patients as well as cancer rehabilitation.

Our program is proud to recognize Dr. David Langelier, one of our current PGY4 trainees, who was awarded third place for his abstract entitled “Traumatic-Unmasking of a Schwannoma Mimicking Post Concussion Syndrome” at the Canadian Association of Physical Medicine & Rehabilitation (CAPM&R) Conference.

Since our residency training program’s inception in 2004, all of our graduating University of Calgary PM&R residents have successfully passed their Royal College Certification examinations (100 per cent pass rate). As well, all of our trainees who have challenged the licensing examination for EMG (electromyography) have passed, which is a reflection of the strong partnership that Physiatry has with our fellow neuromuscular colleagues and the excellent training that our residents receive. Our residents have also all successfully started their careers in either tertiary centres, mid-sized or large community-based practices. Their varied career paths have included some choosing extra subspecialty fellowship training, significant research and clinical combinations, teaching and faculty development involvement and those choosing full time community clinical practice.

Neurosurgery residents attend the 2016 Alberta Neurosurgical Society Annual Meeting & Resident Research Symposium at the Banff Springs Hotel. ▲

Neurosurgery Residency Program

Program Director: Dr. Jay Riva-Cambrin
Program Administrator: Patti Sullivan
Number positions per year: 2
Accreditation: Royal College of Physicians and Surgeons of Canada
Length of Training: 6 years
Mandatory Research Block: 1 year

Education of our postgraduate and undergraduate students remains one of the highest priorities of DCNS and the Section of Neurosurgery. The teaching faculty consists of a large complement of dynamic key opinion leaders representing all subspecialties of neurosurgery, including vascular, interventional, intracranial lesions, skull base, epilepsy, functional and peripheral nerve interests. In addition, the University of Calgary boasts the largest comprehensive spinal surgery program in Canada with a total of 11 full-time spine surgeons coming from both neurosurgical and orthopedic backgrounds.

Dr. J. Riva-Cambrin

From the moment residents enter the program, they are continuously involved in research and education initiatives. Considerable resources are dedicated each year to facilitating academic activities through faculty participation, existing peer-reviewed grants, project funding from sectional and department sources and a minimum of 12 months of clinical or basic science research. The neurosurgery educational half-day runs each week for three hours on Monday afternoons. Sessions are led by the residents and supervised by the faculty, creating a learning environment within the realm of neurosurgical expertise.

A number of our residents continue to garner awards and scholarships for their outstanding clinical and academic endeavors in addition to a few celebrating marriages and births. Dr. Michael Yang achieved the pediatric top poster award at the 2015 AANS annual meeting; Dr. Michael Avery was awarded the Joe Niekro Research Grant, Canada Graduate Scholarship-CIHR, and Denyse Lajoie-Lake Fellowship; Dr. Michael Tso was awarded the K.G. McKenzie Memorial Prize Basic Neuroscience Research at the 2016 CNSF Congress; and Dr. Candice Poon was awarded the Bryce Weir Award, the Queen Elizabeth II Graduate Scholarship, Faculty of Graduate Studies Doctoral Scholarship, the Clark H. Smith Brain Tumour Centre Graduate Studentship as well as second prize for her poster at the Hotchkiss Brain Institute Research Day; just to name a few.

After just over ten years as Program Director, Dr. John Hurlbert has relocated to Tucson, Ariz. to begin a new phase in his career building a new spine program at the University of Arizona. Dr. Jay Riva-Cambrin took over the reins of Program Director and is excited to lead the residency program during the transition to the Royal College competency based training over the next few years.

Team relationships outside the hospital are of equal importance to the Section of Neurosurgery as they are within the hospital. The program offers a well-rounded exposure to all aspects of neurosurgery within a close and collegial environment. Non work-related, team-building events held throughout the year provide a healthy balance against a busy lifestyle choice. The end result is a recipe for one of the most cohesive, dedicated, and high-performing resident groups in all of Canada and a group that we are proud to call our own.

Resident uses PhD to find ways to repair leaky blood vessels

APPARENTLY, NEUROSURGERY RESIDENCY isn't enough of a challenge for R5 resident Dr. Michael Tso.

After joining the DCNS program in 2009 from the University of British Columbia, Dr. Tso found himself driven to study subarachnoid hemorrhage (SAH) and add a PhD at the University of Toronto in the process.

The four-year program, under the guidance of famed cerebrovascular neurosurgeon Dr. Loch Macdonald, has allowed Dr. Tso to delve into genetic opportunities to reverse the damage of aneurysms.

"Some people look at the prevention of the aneurysm," he says. "I'm looking at, once the aneurysm has ruptured, how can we minimize the damage?"

His thesis, which he plans to defend in the New Year, led him to take a fresh look at leaky blood vessels—in a mouse model—and the different genes that are affected by a bleeding stroke.

"The research I've done is to look at the blood vessels of the brain, isolate them, and look at the gene expression patterns."

The work is daunting, he's the first to admit, but its impact could be tremendous. Even though SAH accounts for only a small minority of strokes, it has a disproportionate effect on those in their working years.

"They are mid-career, they have kids," says Dr. Tso, "they're in the prime of their lives."

That impact pushed him to focus on the genes that could help repair damage after brain trauma—and drugs that could then target those genes. And a solution could be applicable to a host of other neurological conditions, like Alzheimer's, multiple sclerosis, Parkinson's, brain tumours, and traumatic brain injury.

"There's only one drug that improves outcomes, and while it's not really clear how it improves outcomes, it does—by 10 per cent. But since 1989 there have been no new drugs to improve this."

Dr. Tso would like to add one more tool to physicians' toolkits. One that he could put to use when he completes his residency in 2018.

(Dr. Tso's research was funded by the Neurosurgery Research and Education Foundation (NREF) and supported by the Vanier Canada Graduate Scholarship.)

Neurosurgery resident Dr. Michael Tso. ▶

Fellowships in Clinical Neurosciences

Overview

The Department of Clinical Neurosciences (DCNS) at the University of Calgary offers one and two year basic science, clinical and/or research fellowships designed to provide enhanced broad-based clinical training and responsibility beyond the certification level, as well as clinical research opportunities.

DCNS averages 30 fellows each year who work and study in the following specialties:

- Stroke
- Spinal Neurosurgery
- Peripheral Nerve
- Functional Neurosurgery
- Stereotactic and Functional Neurosurgery
- Neuro-oncology
- Endovascular Neurosurgery
- Epilepsy
- Headache
- Multiple Sclerosis
- Neuromuscular

As a joint department in both the University of Calgary and Alberta Health Services, DCNS is uniquely positioned to advance research from the laboratory directly to the patient's bedside.

These opportunities have helped the department attract fellows from a wide variety of backgrounds seeking further subspecialty experience. Their presence has enriched the clinical and academic environment for all.

We are also pleased that many of our fellows have received international awards during their fellowship training and numerous have gone on to faculty positions worldwide.

For more information on fellowship opportunities, please contact us at **www.ucalgary.ca/dcns/education/fellowship-program**

Research in Clinical Neurosciences

Overview

The Department of Clinical Neurosciences (DCNS) was founded 35 years ago on the premise that excellence in patient care and excellence in research go hand in hand. We see them not only as inseparable, but synergistic.

Many of the physicians and surgeons in Clinical Neurosciences are actively engaged in research, however some focus exclusively in patient care. The spirit of research and innovation are integral to our team and are continuously fostered. Members of our department lead a variety of research programs and our research is facilitated by strong partnerships with the Hotchkiss Brain Institute (HBI), clinical departments within the Calgary Zone of Alberta Health Services, as well as other public and private organizations. Our members' research efforts focus on the following areas:

- **Basic Research:** The study of biology and mechanisms of disease.
- **Translational Research:** Which involves taking findings from basic research and moving them quickly and efficiently into medical practice to improve disease treatment or other health outcomes.
- **Clinical Trials Research:** The comparative testing of new treatment ideas against current standards of care to determine which is superior.

▲ **Neurologist Dr. Michael Hill is interviewed, along with Dr. Mayank Goyal, by CTV News about their ongoing research into endovascular treatment for ischemic stroke.**

- **Health Services Research:** The study of health care access and health care delivery to detect deficiencies and design improvements. Health services research often involves careful analysis of databases.
- **Population Health Research:** The study of disease in populations to find risk factors and design prevention methods.

Our research-focused doctors and scientists are also members of the Cumming School of Medicine, Alberta Health Services (AHS) and the Hotchkiss Brain Institute from which they receive invaluable assistance, mentorship and support. Indeed, much of our success in research as a clinical group can be traced to these very strong linkages.

Our faculty members publish the results of their studies in the top medical and scientific journals and they play leading roles in a wide variety of local, national, and international academic and professional organizations. Their efforts are generously supported by grants from a wide range of external agencies.

NEUROLOGY

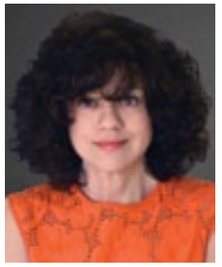

Yahya Agha-Khani


Katayoun Alikhani


Farnaz Amoozegar


Simerpreet Bal


Philip Barber

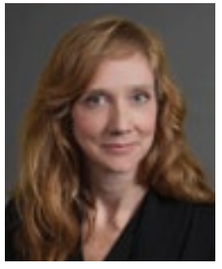

Jodie Burton


Kevin Busche


Greg Cairncross


Sameer Chhibber


Lara Cooke


Fiona Costello


Shelagh Coutts


Jeptha Davenport


Andrew Demchuk


Paula de Robles


Hamid Ebadi


Arnolda Eloff


Tom Feasby


Paolo Federico


William Fletcher

NEUROLOGY

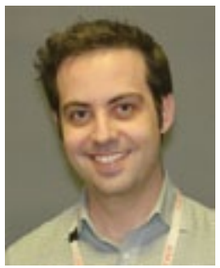

Sarah Furtado


Alexandra Hanson


Michael Hill


Scott Jarvis


Nathalie Jetté


Colin Josephson


Ronak Kapadia


Brian Klassen


Gary Klein


Marcus Koch


Jagdeep Kohli


Lawrence Korngut


Scott Kraft


Bijoy Menon


Luanne Metz


William Murphy


David Patry


Dawn Pearson


Gerald Pfeffer


Neelan Pillay

NEUROLOGY


Tamara Pringsheim

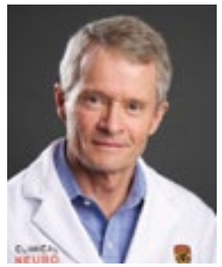

Ranjit Ranawaya


Justyna Sarna


Eric Smith


Peter Stys


Suresh Subramaniam


Tim Watson


Chris White


Samuel Wiebe


Scott Wilson


Katie Wiltshire


Michael Yeung

NEUROSURGERY


Steven Casha


Stephan du Plessis

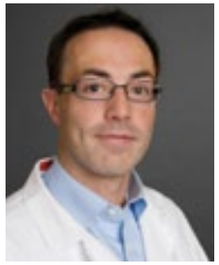

Clare Gallagher


Walter Hader

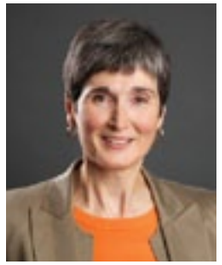

Mark Hamilton

NEUROSURGERY


John Hurlbert


Bradley Jacobs


John Kelly


Zelma Kiss


Rajiv Midha


Alim Mitha


Jay Riva-Cambrin


Yves Starreveld


Garnette Sutherland


John Wong

PHYSICAL MEDICINE & REHABILITATION


Lee Burkholder


Chantel Debert


Darren Chiu


Nwamara Dike


Sean Dukelow


Vincent Gabriel


Vithya Gnanakumar


Chris Grant


Arun Gupta

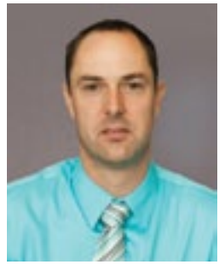

Denise Hill

PHYSICAL MEDICINE & REHABILITATION


Chester Ho


Chris Huang


Ken Lam


Les LaPlante


Daniel LeBlond


Gentson Leung


Rodney Li Pi Shan


Christine McGovern


Dan McGowan


Stephen McNeil


Serge Mrkobrada


Stephanie Plamondon

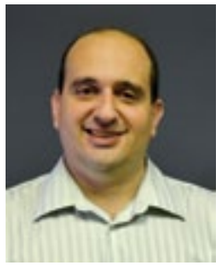

Jordan Raugust

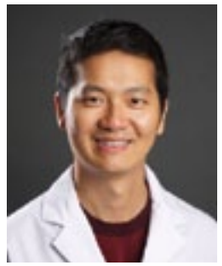

Vishal Tulsi


Noorshina Virani

TRANSLATIONAL NEUROSCIENCE

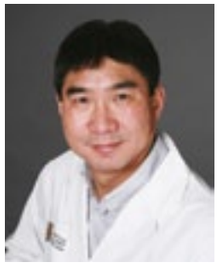

Bin Hu

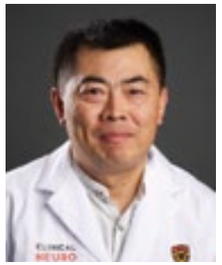

Oury Monchi


Minh Dang Nguyen


Shalina Ousman

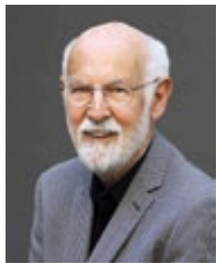

Boguslaw Tomanek


V. Wee Yong


Zonghang Zhao

EMERITUS


Werner Becker


Keith Brownell


Manuel Hulliger


John Latter


Francis LeBlanc


Robert G. Lee


Terry Myles

Neurology

Neurosurgery

Physical Medicine and Rehabilitation

Translational Neuroscience

Department of Clinical Neurosciences

Room 1195 – Foothills Medical Centre
1403 29th Street N.W.
Calgary, Alberta
T2N 2T9
403-944-1260
www.ucalgary.ca/dcns

Alberta Health Services

CLINICAL NEURO SCIENCES
CALGARY CANADA

UNIVERSITY OF CALGARY