



1981-2016

CELEBRATING OUR PAST
EMBRACING OUR FUTURE

CLINICAL
NEURO
SCIENCES

CALGARY ♦ CANADA

ANNUAL REPORT
2014 - 2015

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.



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Message from the Department Head

Dr. Rajiv Midha

**It's always good to remember
where you come from and celebrate it.
To remember where you come from
is part of where you're going.**

IN 2016, THE DEPARTMENT OF CLINICAL NEUROSCIENCES will commemorate 35 years since it was founded.

It is a fitting time to celebrate our history, people and accomplishments—and embrace our very bright future.

The department began in 1981 with the visionary work of **Dr. Frank LeBlanc** and **Dr. Robert Lee** who, along with a number of others, extracted Neurosurgery out of the Department of Surgery and Neurology from the Department of Medicine to form a combined department.

Our medical school—now the Cumming School of Medicine—has been incredibly supportive of this department over the years. And we have benefited from strong leadership internally; not only from the prior three department heads—**Dr. Robert Lee, Dr. Tom Feasby** and **Dr. Greg Cairncross**—but also the large supporting cast of dedicated section heads, residency program directors and clinical and academic program leaders.

With the growth of the city of Calgary and the economy over the past couple of decades, we have

Anthony Burgess

Writer, composer, playwright

Feb. 25, 1917 – Nov. 22, 1993

developed a large and comprehensive department. With close to 100 faculty, these members are distributed across four sections: Neurology, Neurosurgery, Physical Medicine & Rehabilitation, and Translational Neurosciences.

In the past year, our faculty continued that growth with the addition of **Dr. Simerpreet Bal, Dr. Christopher Grant, Dr. Scott Jarvis, Dr. Gerald Pfeffer** and **Dr. Justyna Sarna**. These world-class physicians will ensure we continue to deliver on our clinical, academic and research objectives.

We salute a number of our colleagues who have recently retired: **Dr. Robert Bell, Dr. Keith Brownell, Dr. Manuel Hulliger** and **Dr. Keith Hoyte**. Their dedication lifted us to where we are today and we are grateful for their contributions to patient care, education and translational research.

In addition to doctors, we celebrate the nurses, Allied Health professionals and the administration and support team with whom we work, including our Executive Director, **Cathy Edmond**. They allow us to bring the highest level of knowledge, the newest discoveries and fantastic technical expertise to our patients.



**Dr. Robert
Bell**



**Dr. Keith
Brownell**



**Dr. Keith
Hoyte**



**Dr. Manuel
Hulliger**



Our members are fortunate to be able to employ the latest technology, which is so important for improving clinical care in our disciplines. We not only harness it, but we innovatively bring forward new technology.

Along with our clinical advances, our research has blossomed over the decades—especially since the advent of the Hotchkiss Brain Institute approximately 11 years ago. Our partnership with the HBI is extremely strong.



Recent examples include the ESCAPE Trial, which the Stroke program led and, more recently, **Dr. Luanne Metz** and **Dr. Wee Yong** with their very exciting results of Minocycline therapy in Relapsing Remitting Multiple Sclerosis.

Individually and collectively, we are also a group of inspiring teachers. Many of our past and current members have been involved in the development of the medical school at the University of Calgary, curriculum building as well as serving on various levels of the Executive and at the Dean's level. I am particularly impressed by the residency

training programs in all three sections. These are amongst the strongest, if not the strongest, in Canada in their respective disciplines.

We are thankful that all this work is recognized by our community, who provide tremendous support, philanthropic and otherwise, to our members.

Our efforts have also been recognized within the medical and academic communities, most recently exemplified by **Dr. Luanne Metz** receiving the AMA Medal for Distinguished Service—an honour that has been received by several of our faculty members over the years.

These are but a few examples that illustrate how the stature of the department has grown tremendously over these past 35 years. We have evolved from a national leader to one that is clearly international—not just in Stroke and MS but many others such as Epilepsy and Spine.

Thank you for taking a moment to celebrate with us.

We hope you enjoy our annual report.

ONWARDS!

DCNS celebrates 35 years of growth and innovation

Dr. Tom Feasby



Dr. Betty MacRae



Dr. Greg Cairncross



“The original proposal that we drafted, I think, was called a Regional Program for Neurology and Neurosurgery for Southern Alberta. I didn’t really say anything about a department!”

— Dr. Robert Lee, co-founder,
Department of Clinical Neurosciences

“LOOKING BACK ON IT, I THINK WE WERE PRETTY AMBITIOUS!” recalls Dr. Robert Lee.

It was the Fall of 1979 and neurologist Dr. Lee and neurosurgeon Dr. Frank LeBlanc had been scheming with their colleagues about pooling their resources and creating something great for the people of Calgary.

At a party in Airdrie, Dr. LeBlanc and Dr. Peter Seland met then-Premier Peter Lougheed and pitched a neuroscience institute for the city.

It was rejected.

Instead, however, they were given the green light to form a Department of Clinical Neurosciences—and the rest is an incredible history.

“I think there were a total of seven neurologists in the city and five neurosurgeons and, out of those, I think there were only three full-time GFT university positions,” says Dr. Lee.

So they recruited neuropathologists and other specialists; they created a neurological nursing program; and they formed residency programs.

But most importantly, they united a group of professionals who had a common interest—the nervous system.

To mark the 35th anniversary, which will be celebrated in 2016, some of the department’s former leaders have recorded their stories about DCNS for the future. They include Dr. Tom Feasby, Dr. Greg Cairncross, Dr. John Latter, Dr. Betty MacRae, Dr. Terry Myles, and Dr. Lee and Dr. LeBlanc.

And on Nov. 7, 2015, they joined current members of the department to kick-off the 35th anniversary celebration at a “gala event” at Hotel Arts.

“I can’t think of a more heart-warming development for me,” says Dr. LeBlanc, “than to see that the leadership that has gone on since my retirement has been stellar!”



Dr. Robert Lee, left and Dr. Frank LeBlanc reminisce about the early years of the department.



Cumming School of Medicine Dean Jon Meddings addresses the department at the 35th Anniversary Gala in November.



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.

All 54 Calgary neurologists are members of the section and contribute to both inpatient and outpatient care. Patient care is at the centre of our existence and consumes 65-70 per cent of the overall effort of section members.

The section is organized into several subspecialty care programs. These programs include headache, neuromuscular, ALS, multiple sclerosis, neuro-immunology, movement disorders, epilepsy, general 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 subspecialty clinics and neurophysiology labs.

The section operates as a cohesive unit to provide city-wide emergency and inpatient services. One team provides general neurology support to the four adult acute care hospitals. This includes inpatient



neurology consultation services at all four sites and neurology inpatient ward services at FMC and SHC. Another team of subspecialty stroke neurologists provides acute stroke care at FMC and provides city-wide leadership in stroke management. A third service of sub-specialty trained 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 its research productivity and the major clinical impact of many of its research endeavors. We believe and have demonstrated that care can be improved through innovative research.

Our researchers include clinician scientists and population health investigators who spend 70-80

per cent of their time undertaking research, clinical researchers who support research by spending 20-65 per cent of their time doing research, and clinicians who spend up to 15 per cent of their time contributing to research. In addition, neurologists hold major positions in research leadership including within the University of Calgary.

Neurologists Dr. Michael Hill (Associate Dean Clinical Trials) and Dr. Sam Wiebe (Associate Dean Clinical Research) hold such leadership roles. An outstanding example of our research is the ESCAPE Trial initiated and led by members of our stroke program, Dr. Michael Hill and Dr. Andrew Demchuk. **See story Page 8.**

Education

In addition to the dedicated neurologists leading our residency program (Dr. Michael Yeung), the undergraduate neuroscience course (Dr. Gary Klein, Dr. David Patry, Dr. Jephtha Davenport), the neurology clerkship (Dr. David Patry), and continuing medical education (Dr. Justyna Sarna) neurologists hold important education leadership positions in the University.

Dr. Lara Cooke is Associate Dean of Continuing Medical Education and Dr. Kevin Busche is Assistant Dean of Undergraduate Education. We also have several very popular subspecialty Fellowship programs.

Our residents continue to be successful in obtaining their Royal College certification and in developing successful careers. That several of our residents are undertaking graduate degrees in Medical Education, speaks to the positive examples provided by our neurologist educators and how seriously we take this role.

The educational highlight of this past year was a very positive external review of our Residency Program by the Royal College; we are all grateful for the very hard work put in by Dr. Michael Yeung (Neurology Residency Program Director) and Elizabeth Martens (Neurology Residency Program Co-ordinator).

Changes in Our Team

This year we say goodbye to two colleagues who chose to retire.

- Dr. Keith Brownell retired as of June 2015 after 40 years practicing general and neuromuscular neurology and a distinguished academic career that focused on education and medical ethics. **See story Page 10.**
- Dr. Arnolda Eloff retired after 12 years of subspecialty headache practice as part of the CHAMP program in Calgary; she had previously practiced in South Africa. It will be hard to replace her dedication to provide care to people with headache.

We have also been fortunate to welcome four new neurologists.

- Dr. Hamid Ebadi joined us from Toronto where he completed subspecialty training in EMG and neuromuscular disease.
- Dr. Scott Jarvis joined the multiple sclerosis and general neurology teams after completing subspecialty training in multiple sclerosis.
- Dr. Gerald Pfeffer joins us as a clinician scientist after completing a lab-based PhD in the genetics of neuromuscular disease from Newcastle University.
- Dr. Simerpreet Bal joined our team of general neurologists at the PLC, where he will lead the development of stroke services.

Other Highlights

- Dr. Katie Wiltshire assumed the role as leader of the General Neurology Program.
- Dr. Paula de Robles assumed leadership of the Neuro-oncology Program.
- Neurology resident Dr. Aravind Ganesh was the only Canadian selected to sit on the Resident and Fellow Section Editorial Team for the journal "Neurology".

Calgary team changing the way the world treats ischemic stroke

THE CALGARY STROKE PROGRAM'S ESCAPE

trial results were published in the New England Journal of Medicine Feb. 11, 2015, at the same time as the team presented their findings at the International Stroke Conference in Nashville, TN.

The randomized clinical trial, which compared traditional ischemic stroke treatment to an innovative endovascular therapy, was led by principal investigators Dr. Michael Hill, Dr. Mayank Goyal and Dr. Andrew Demchuk.

By implementing the new endovascular therapy, which involved rapid brain imaging, an innovative treatment workflow and novel technology to open up the artery, researchers found the number of patients able to return to independent living jumped to 55 per cent from 30 per cent in the control group.

"What this trial has shown is that, using the procedure to open up the vessel—to go into the blood vessel and pull the clot out—is dramatically beneficial," said Dr. Goyal.

"One of the things that we say is 'Time is Brain'. In a person who is suffering from a blockage of a blood vessel, brain cells are dying. The only way to stop the brain cells from dying is to open the vessel," he said.

Mortality rates in the ESCAPE trial also dropped from 20 per cent to 10 per cent. The therapy was equally beneficial among men and women.

"We found that even patients over the age of 80—the oldest person treated within the trial was 93—showed benefit," said Dr. Goyal.

"Many more patients came back to normal, to independent living, to living with their families."

An ischemic stroke occurs when one of the blood vessels that supply blood to the brain is blocked. Traditionally, clot-busting drugs are used to treat patients.

The Calgary-based ESCAPE trial, which included sites across Canada, the U.S., South Korea and Europe, used a stent to retrieve the clot and

"One of the things that we say is 'Time is Brain'. So in a person who is suffering from blockage of the blood vessel, brain cells are dying. And the only way to stop the brain cells from dying is to open the vessel.'"

— Dr. Mayank Goyal

developed entirely new processes to allow for rapid patient imaging and preparation for the procedure.

"Stroke care is going to have to change a lot because the whole process of treating patients with this therapy requires tremendous organization," said Dr. Hill.

"It requires careful attention to imaging of the brain, and substantial teamwork and parallel processing of workflow."

Calgary patients selected for the trial were treated at Foothills Medical Centre and first underwent imaging to determine where the clot was in the brain. Patients were then quickly prepared for the clot-removal procedure, said Dr. Goyal.

"You go in from the groin and put in a tiny tube which, under X-ray guidance, you can move right through the body into the vessels of the neck and through this tube you put an even tinier tube—around one mm in size," he said.

"Under X-ray guidance we take it right to the level of the clot, deploy a retrievable stent, capture the clot and pull it out of the body."

The results were so successful that the trial was stopped early.

"When you pull it out, there's restoration of blood flow to the brain and, so to speak, the brain becomes 'happy' again."

The stroke team at Foothills Medical Centre—part of

THE GREAT ESCAPE



The ESCAPE team celebrates their results being published in February 2015.

the Department of Clinical Neurosciences (DCNS)—is a world-leader in stroke care and spent about nine months designing the trial, said Dr. Demchuk.

“Calgary is unique because we have a very large number of stroke academicians and it crosses multiple disciplines and training experiences,” he said.

“For example, the city has physiatry, neurology, neurosurgery as well as neuroradiology. We have imaging expertise and methodology expertise and trial expertise so it comes together to make something like this happen,” he said.

“Around the world, this is extremely rare—to have all these components. Without DCNS, this group

wouldn't have come together.”

With the release of the results in the prestigious New England Journal of Medicine, Dr. Goyal said the next step is to share the results and help other stroke programs implement the new therapy.

“We need to change guidelines, we need to create the infrastructure and we need to make sure we're able to implement in a fashion that we are able to replicate the results of this trial all across the world,” he said.

“But, to my mind, clearly now there is sufficient evidence to say that this is how stroke care should be done.”

For more information, visit www.escapetrial.org

Rockyview physician and educator reflects on 'living a charmed life'

DR. KEITH BROWNELL IS WELL KNOWN IN THE Department of Clinical Neurosciences for being a man of many hats.

He's been a neurologist, teacher, educational administrator, resident and medical student advocate, ethicist and national physician leader (among other roles).

Dr. Brownell grew up in rural Ontario and progressed from a one-room schoolhouse to Queen's University, where he graduated in 1964 with his MD. He interned at Vancouver General Hospital "because they paid the highest salary of anybody in the country."

"It was \$225 a month," he recalls.

But after practicing medicine in Kamloops for three years, he returned to Queen's to begin residency in neurology.

It was in Kingston that Dr. Brownell began working with Dr. Dennis White, whom he calls his "neurology father."

"He wasn't the guy who was always right, but he would never ever make a mistake because he didn't get all the data," says Dr. Brownell. "He took time with his patients. He was extremely thorough."

After two years at Queen's, Dr. Brownell moved to the University of Michigan in Ann Arbor to complete his residency and then to a junior staff position in neurology.

He did subspecialty training at the Mayo Clinic and could very well have spent his entire career in the United States. But fate (and the U.S. Department of Immigration) intervened.

With three young children in tow, Dr. Brownell and his wife Libby spent weeks jumping through bureaucratic hoops and driving between immigration offices in multiple cities.

And then the letter arrived: "We've rejected your application. Notify us within 48 hours that you're going to be leaving the country."

"It was a very stressful period," he says. So he started looking for a job back in Canada.

"And that wasn't easy," he remembers. "The only job that I was offered was in Calgary."

So, in 1975, now with four kids and a U-Haul, they crossed the border at Coutts.

"I can't imagine a better place to have gone!"

With Dr. Robert Lee, who would later be instrumental in creating the Department of Clinical Neurosciences, Dr. Brownell became the second academic member of the Division of Neurology in the Department of Internal Medicine.

Early on, he set up the first muscle pathology laboratory in Calgary and, with a little push from Dr. Clarence Guenter, Head of the Department of Medicine at that time, he added Education Administration to his hat collection.

"I learned a lot from Clarence," he says, including the encouragement to push boundaries and try new things.

"There wasn't a lot of 'this is the way we've done it for the last hundred years.' " Dr. Brownell says.

"If you had a good idea, and you were prepared to do the groundwork, it would fly."

Teaching was a natural fit and Dr. Brownell says he was always passionate about modeling behaviour for his students.

That relationship with patients, says Dr. Brownell, can't be rushed—especially when it involves dealing with life-changing illnesses.

In his clinic, he remembers agonizing conversations with patients; for example, delivering the news that they have been diagnosed with muscular dystrophy or ALS.

"You need to understand that they'll probably not hear you correctly."

"So bring them back tomorrow," he would teach his students.

(Continued on Page 13)



Parkinson's therapy gives patient control over dopamine delivery

LIKE MANY NEUROLOGICAL CONDITIONS, the treatment of Parkinson's disease is as varied as the patients seen by neurologists in the Movement Disorders Clinic.

Deep brain stimulation (DBS) has been used successfully in some patients, but it comes with risks associated with any invasive surgical procedure.

Others, who aren't candidates for DBS, rely on oral dopamine to compensate for brain cells that no longer produce enough of the compound naturally.

The drug, called levodopa, is effective but it's difficult to deliver a steady dose orally because it is absorbed in the small intestine but it can get "stuck" in the stomach.

"The pill stays there and you don't get the benefit," says neurologist Dr. Ranjit Ranawaya.

"You may take a second pill and then the stomach opens up and you get too much of the levodopa."

Not enough medication brings the return of tremors and stiffness for patients. But too much can lead to dyskinesia—involuntary muscle movements. And with a half-life of 90 minutes, it's difficult to co-ordinate the timing of medication with a patient's symptoms.

To bypass the stomach "roadblock", Dr. Ranawaya and his Movement Disorders team have been treating a small number of patients with a pump that can deliver medication directly into the small intestine.

The device, about the size of a credit card machine at the grocery checkout, has been used on a select group of patients with advanced Parkinson's.

The Duodopa pump is connected to a PEG tube, which involves a minor surgical procedure to access the stomach, and it feeds the small tube through the stomach into the small intestine.

Medication can then be delivered directly into the gut, where it is absorbed into the bloodstream.

For patient Linda McIntyre Swanson, the inconvenience of having to carry around a pump has been worth it.

"It's changed everything. I was having trouble sleeping because of all the medications I was taking. I couldn't settle down; I was just wired. I was going to bed at one o'clock in the morning."

Swanson is now more steady on her feet, is no longer covered in bruises from falling, and is dancing again. "The pump is a nuisance, but I've learned to make it my friend," she laughs.

Swanson is one of five patients receiving Duodopa treatment in Calgary since the program started at the end of 2014.

Her husband, Richard, helps with the pump and appreciates the ability to fine-tune the delivery of medication.

"After supper, if we're sitting on the couch watching TV and Linda's got some dyskinesia, she just turns her pump off for a while," he says. "And eventually the dyskinesia will go away and then she'll start the pump again."

For Dr. Ranawaya, the results are promising, but the treatment is not without its challenges.

The drug is very unstable in its liquid form—requiring refrigerated storage—and the tube requires regular attention.

"The intestine and the stomach are always contracting," he says. "Sometimes the tube will come up into the stomach or migrate."

The cost is also a concern. The Duodopa drug for each patient is approximately \$60,000 per year, which is currently being covered by an Alberta Health program for exceptional drug therapy and by some private insurers.

"We're trying to identify individuals it would make a big difference to—which are usually people who could go for (DBS) surgery—but they don't want it or can't have it," says Dr. Ranawaya.

He's found such an individual in Linda McIntyre Swanson.

"We went dancing at New Year's last year and we had a good time. So I'm going to go again. I'm not going to stay home and worry about it."



Linda McIntyre Swanson visits with Dr. Ranjit Ranawaya.

DR. KEITH BROWNELL
(Continued from Page 10)

But above all, he says, “Don’t forget you’re a human being.”

Though physician guidelines stress objectivity, Dr. Brownell says he would never hesitate to reach out and hold the hand of a distraught patient.

“I always tried, when I went into an hospital room to meet a patient, either to sit down or to raise the bed up to my eye level. I would introduce myself and I would introduce the students.”

In addition to a sabbatical at Laval University that solidified his interest in medical professionalism and ethics, Dr. Brownell credits his move to Rockyview General Hospital as a great boost to his career.

The patient population at Rockyview was more typical of what would be seen in a general neurology practice, which was important for students and residents to experience. Up to that time there had not been any member of the academic staff at Rockyview.

His request was agreed to, and it was there at Rockyview in 2014 that he saw his last patients—some of whom he first saw in 1975—before retiring and taking off one of his hats.

“I have lived a charmed life,” he says.

“Calgary has been good to Libby and me and it was a great city in which to raise our five children. As for my academic and clinical career, I cannot think of a better place to have worked,” he smiles.

“I’m glad Calgary was the only place I could get a job!”

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. The research team has strong collaborations with the Hotchkiss Research 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 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.
- 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 Calgary Zone
- Neuropsychologists, Clinical Psychologists and Neuropsychiatrists focusing on epilepsy provide care to patients in the CEP.
- Epilepsy surgery for drug resistant epilepsy comprises intracranial EEG using Stereo-EEG techniques, 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, International League Against Epilepsy, and North American Commission of the ILAE, as well as in other international neurological organizations.

Highlights

- The CEP held a very successful 6th International Epilepsy Symposium in October 2015, focusing on "Post-traumatic Epilepsy." In addition to our local speakers, the one-day symposium featured five renowned international researchers in the field including Dr. Asla Pitkänen, Dr. Marilyn Jones-Gotman, Dr. Ramon Diaz-Arrastia, Dr. Nancy Temkin and Dr. Paul Vespa.
- The 2015 Mary Anne Lee Memorial lecturer in epilepsy was Dr. Asla Pitkänen from the University of Eastern Finland, who spoke on "How Does the Brain Develop Epilepsy?" 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 was inducted to the Royal Society of Canada College of New Scholars, Artists & Scientists. She also became an Associate Editor of *Epilepsia*, is leading the Neuro-Research Clinics initiative in the Hotchkiss Brain Institute, is the President of the Canadian League Against Epilepsy, chairs numerous international committees, published over 30 peer reviewed articles, and she continues to be highly sought after educator and academician.
- 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. Macrodimitris and Dr. 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. Partlo and Dr. 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 has 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. Wiebe assumed the Directorship of the CEP, continues to serve as Associate Dean of Clinical Research, leads the Clinical Research Unit for the Cumming School of Medicine, and serves on the Executive Board of the International League Against Epilepsy. This year the CEP database moved towards producing patient-specific information services and dashboards, which will be gradually implemented in the clinic. Dr. Wiebe continues to focus on outcomes and health services research.

Members

Physicians: Dr. Yahya Agha-Khani, Dr. Alexandra Hanson, Dr. Walter Hader, Dr. Paolo Federico, Dr. Nathalie Jetté, Dr. Brian Klassen, Dr. Brianne McLean, Dr. Aaron Mackie, Dr. William Murphy, Dr. Neelan Pillay, Dr. Yves Starreveld, Dr. Samuel Wiebe

Psychology team: Dr. Sophia Macrodimitris, Dr. Ruby Sharma (clinical psychologists), Dr. Lisa Partlo (neuropsychologist), Kim Goddard

Neuroradiology: Dr. James Scott

Nuclear Medicine: Dr. Christine Molnar

Epilepsy Fellows: Dr. Colin Josephson, Dr. Shaily Singh, Dr. Sherry Sandy

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.

Highlights

- One extraordinary achievement of the program this year was a pioneering role in changing the treatment for acute stroke using catheter stent retrieval devices to mechanically remove the thrombus from the brain artery. This mechanical thrombectomy approach using endovascular techniques was evaluated in the multi-centre, multinational randomized clinical trial entitled ESCAPE. This trial was led and co-ordinated by the Calgary Stroke Program with Michael Hill as PI and Mayank Goyal and Andrew Demchuk as Co-PIs. **See story Page 8.**
- The clinical research component of the stroke program, led by Dr. Michael Hill (PI), and Andrew Demchuk (co-PI) obtained a five-year, \$1.5 million ICRH emerging networks grant in collaboration with the Canadian Stroke Consortium and Canadian Partners for Stroke Recovery entitled "CaSTOR Canadian Stroke Trials for Optimized Results".
- Dr. Shelagh Coutts completed and published the TEMPO-1 trial. This trial was a dose escalation study aiming to determine the most appropriate dose of Tenecteplase (2nd generation tPA) to use for a planned randomized clinical trial of IV thrombolysis in mild stroke patients with an intracranial occlusion (TEMPO-2).
- Dr. Bijoy Menon was a recipient of a Calgary's Top 40 Under 40 award
- Dr. Eric Smith received a grant from the CIHR to study biomarkers of inflammation and vascular reactivity in patients with cerebral amyloid angiopathy, a cerebrovascular disease that causes brain hemorrhages and vasculitis.
- Dr. Simer Bal joined our group as new faculty from the University of Manitoba where he was an Assistant Professor.
- Dr. Phil Barber led the development of a provincewide syllabus and curriculum for

Fellowship training in stroke as part of the QuICR Education Program.

- Dr. Ken Lam, Dr. Sean Dukelow and Stuart Miller helped to facilitate Functional Electrical Stimulation training sessions for therapists and therapy assistants in day long courses held in Calgary, Lethbridge and Medicine Hat.
- Bonnie Poon joined our group as the new Stroke Rehabilitation Co-ordinator.
- The Calgary Stroke Program was a finalist for the 2015 ASTech Foundation Societal Impact Award.

Education

As of June this year, our program has trained and graduated 55 stroke Fellows, from 17 countries including Canada. Last year we trained eight Fellows including four Canadians. In addition, we have seen a major increase in applications to our Fellowship with two to three applicants per month.

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. We function as the CT core lab for many multi-centre randomized trials.

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: Dr. Teri Green

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 about the medical evaluation and treatment of cognitive disorders and dementia, and conducts research on the causes and treatment of cognitive disorders.

Program members include neurologists, psychiatrists, neuropsychology, 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

Thanks to a donation from the Ron and Rene Ward Foundation to the University of Calgary, the new Healthy Brain Aging Laboratories were built in renovated space in the Health Sciences Building at the University of Calgary. This new space is close to the University of Calgary Medical Clinics and will allow us to combine research with clinical care more closely than ever before. The new space will also include a new facility for brain banking.

Dr. Zahinoor Ismail led an Alzheimer's Association Professional Interest Group writing committee which produced the first consensus diagnostic criteria for Mild Behavioural Impairment, an increasingly recognized clinical entity that can precede neurodegeneration and dementia.

Education

The Program recently accepted our first Fellow in Cognitive Neurology, Dr. Alicja Cieslak. Dr. Cieslak completed her neurology residency at the University of British Columbia. She started her Fellowship in July 2015. Additionally, the Cognitive Neurosciences Clinic provides training experiences for residents from various disciplines—including neurology, psychiatry and geriatric medicine—as well as medical students. In 2014-2015 three graduate students received their Master's degree under the supervision of Cognitive Neurosciences Program members: Aaron Switzer (Neuroscience), Neveia Case (Medical Sciences) and Rachel Wang (Neuroscience).

Research

The Hotchkiss Brain Institute has reorganized its researchers into Neuroteams. Dr. Eric Smith will lead the Dementia and Cognitive Disorders Neuroteam. The goal of this Neuroteam is to bring 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. Eric Smith leads the Vascular Illness team within the consortium, and Dr. Ismail is a member of the Vascular Illness team and the Neuropsychiatry team. One of the activities of the Consortium is to examine the risk factors and outcomes of neurodegenerative diseases and vascular cognitive impairment, as part of a new observational longitudinal cohort study called COMPASS-ND.

Cognitive Neurosciences Program activities are supported by the University of Calgary Katthy Taylor Chair in Vascular Dementia, held by Dr. Smith. The Chair has supported pilot projects and graduate students of Program Members Dr. Philip Barber and Dr. Zahinoor Ismail.

In 2015, Dr. Eric Smith was awarded a five-year grant from the Canadian Institutes of Health Research to study vascular reactivity, iron accumulation and inflammation in 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, cerebral amyloid angiopathy 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

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. This system is now taking referrals and booking patients for all of the hospital-based general neurologists in the section. This has allowed us to understand the supply and demand requirements for general neurology services in Calgary. It has also helped us to provide better patient care by recognizing more urgent referrals on a consistent basis and recognizing patients that are more appropriate for an appointment in one of the subspecialty clinics.

The development of the CAT system spurred the development of the General Neurology Program. Prior to this, there were many neurologists seeing general neurology patients individually without a clear understanding of the overall community needs. Throughout the past 3 years we have

moved towards bringing together individual general neurologists under the umbrella of the program. We have worked towards building common processes for booking patients and providing ongoing improvements in clinical care for general neurology 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. Michael Yeung, Dr. Jodie Burton, Dr. Alex Hanson, Dr. Michael Hill, Dr. Phil Barber, Dr. Lara Cooke, Dr. Marcus Koch, Dr. Kevin Busche, Dr. Jephtha 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

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

Program Lead: Dr. Katayoun Alikhani

Overview

The goal of the Multiple Sclerosis (MS) Program is to prevent or lessen disability and optimize the wellness of patients with MS and other Central Nervous System (CNS) demyelinating disorders.

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, including residents and clinical fellows.

Research

In association with the Hotchkiss Brain Institute, active research includes: translational research, clinical and epidemiological research, basic science, innovations in imaging and trial design and clinical trials. The MS research director is Dr. Luanne Metz, and the Clinical Trials director is Dr. Michael Yeung.

The Headache Program

Program Lead: Dr. Jephtha 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. In addition, they have participated in the International Headache Academy courses which was held in Phoenix, AZ in January 2014 and at the National Institutes of Health in June 2015.

One of our occupational therapists, Ms. Allison McLean, has been working with staff from MyHealth Alberta to finalize and launch our web-based sleep workshop for Albertans with headaches.

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. These include a new guideline publication in the Canadian Journal of Family Practice on the “made in Alberta” Guideline for Primary Care Management of Headache in Adults; reviews in the journal Headache and in the American Academy of Neurology Continuum publication on the acute treatment of migraine; a review on the treatment of migraine in emergency settings published in Cephalalgia; and a publication with the late Dr. Pam Barton which reviewed resource utilization and outcomes in our interdisciplinary Calgary Chronic Pain Centre headache program.

DCNS Members

Dr. Farnaz Amoozegar, Dr. Werner Becker, Dr. Lara Cooke, Dr. Jephtha 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

Program Lead: Dr. Ranjit Ranawaya

Overview

Movement Disorders are diseases that result in slowness of movement such as in Parkinson's disease or involuntary movements such as tremor, dystonia, chorea, bradykinesia, and tics.



Dr. Ranjit Ranawaya

These disorders cause significant disability in one out of every 100 Albertans and impact over 30,000 Alberta families. The program provides a multidisciplinary clinic with a staff of over 20 individuals including specialists in neurology, neurosurgery, psychiatry, nursing, social work, psychology and physiotherapy. The program treats over 2,000 patients with Parkinson's disease, Huntington's

disease, Tourette syndrome, spinocerebellar ataxia, dystonia and tremors.

There is a large research component in the program that focuses on improvements in treatment of Parkinson's disease and related disorders. Research to understand basic mechanisms of disease is co-ordinated through the Hotchkiss Brain Institute. This program is designated as a Centre of Excellence for Parkinson's disease by The National Parkinson Foundation in the USA.

Highlights

- Dr. Tamara Pringsheim organized First Annual DCNS Movement Disorders Symposium, which was held in the Coombs Lecture Theatre. Invited guest speakers included: Dr. Anthony Lang from the University of Toronto; Dr. Alberto Espay, from the University of Cincinnati; and Dr. Joseph Jankovic from Baylor College of Medicine. Topics included Parkinson's disease, Tourette Syndrome, Psychogenic Movement Disorders, plus clinical case presentations of other interesting movement disorders.

Research

- Neuroprotection for Parkinson's disease (PD)
- Music therapy in PD
- Identification of genetic factors in PD
- Neuroprotection for Huntington's disease (HD) as well as two long-term followup prospective observational trials for HD
- Novel treatments in PD, HD, dystonia, and spinocerebellar ataxia
- We continue to do clinical trials in Parkinson's disease, dystonia, Huntington's disease and Tourette syndrome.

Members

Dr. Ranjit Ranawaya
Dr. Sarah Furtado
Dr. Scott Kraft
Dr. Tamara Pringsheim
Dr. Justyna Sarna
Dr. Oury Monchi PhD
Dr. Zelma Kiss
Dr. Bin Hu
Dr. Angela Haffenden
Dr. Jeremy Quickfall
Dr. Aaron Mackie

Nurses - Clinical
Karen Hunka
Pia Lawrence
Nancy Labelle
Tracy Hammer

Nurses - Research
Lorelei Tanish
Carol Pantella
Nancy Labelle
Tracy Hammer

Administration Support
Sue Dalzell
Marlene Conrad
Bonita Woytowich

The Neuro-ophthalmology and Neurovestibular Programs

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

Program Lead (Neurovestibular): Dr. Suresh Subramaniam

Overview

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

Highlights

Over 700 new patients were assessed by each program in the current year. Most patients assessed in the Neuro-ophthalmology Clinic were referred by other specialists. A visual rehabilitation program was started for patients with loss of visual field caused mainly by stroke. The Neurovestibular Program hosted a weekly Urgent Vertigo Clinic, tested 375 patients in the vestibular laboratory and provided vestibular physiotherapy to over 800 patients.

Education

The Neuro-ophthalmology Program trains Neurology and Ophthalmology residents throughout the year. The Neurovestibular Program trains Neurology and Otolaryngology residents. Faculty and staff in both programs provide



Dr. William Fletcher



Dr. Suresh Subramaniam

resident rounds, seminars and examinations and teach medical students and Allied Health staff. Graduates of the Neuro-ophthalmology Fellowship Program include Dr. Elena Sokolova and Dr. Suresh Subramaniam.

Research

Funded research projects in Neuro-ophthalmology include a NIH-sponsored study of idiopathic intracranial hypertension, studies of the roles of hormones, vitamin D and a novel drug in optic neuritis and the use of optical coherence tomography in multiple sclerosis and Parkinson's disease. Projects in the Neurovestibular Program include the study of a prototype rotary chair in the diagnosis of vestibular dysfunction and a study of physiotherapy in vestibular migraine.

Members

Medical Staff

Dr. William Fletcher
Dr. Fiona Costello
Dr. Suresh Subramaniam
Dr. Beth Lange

Neurovestibular Program Administration

Melanie Oszust, RN
Gina Quinn
Michelle Pushka

Vestibular Physiotherapy

Dominique Le Blanc
Veronique St. Georges

Vestibular Laboratory Support

Craig Mulroney

Administration Support

Gina Quinn

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, 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 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

Research

Research at the clinic is focused on:

- (1) improving antipsychotic safety monitoring in children;
- (2) promoting rational pharmacotherapy in children with neurodevelopmental and disruptive behaviour disorders;
- (3) knowledge synthesis and translation;
- (4) exploring novel therapeutic strategies for tics.

We are conducting a prospective longitudinal study of children prescribed antipsychotic medications for neurodevelopmental disorders in which various safety measures, including extrapyramidal symptoms, metabolic, and hormonal side effects are actively monitored using the Canadian Alliance for Monitoring Effectiveness and Safety of Antipsychotic Medications in Children (CAMESA) guidelines. This study is providing important data on the long-term effects of antipsychotic medications in youth.

Our clinic is collaborating with Dr. Frank MacMaster and Dr. Adam Kirton to study the effect of transcranial magnetic stimulation on tics. We are recruiting children for a pilot study of low frequency repetitive transcranial magnetic stimulation of the supplementary motor area as

a treatment for tics. We will also examine what effects this technique has on the concentration of brain metabolites that mediate cortical hyperactivity.

Following the publication of the Canadian guidelines on pharmacotherapy for disruptive and aggressive behaviour in youth in February 2015, Dr. Pringsheim is working in collaboration with the Canadian Pediatric Society and a pan-Canadian team of researchers to improve evidence-based practice in this area. We have developed a national educational curriculum for residents in pediatrics and psychiatry which will be disseminated in 2016. We are also in the initial stages of creating an electronic continuing medical education program for physicians in practice. Through qualitative research methods, we are exploring the barriers and facilitators to practice in order to develop implementation solutions for physicians. In collaboration with Tourette Canada and the Centre for ADHD Awareness Canada, we recently held two focus groups with families affected by disruptive and aggressive behaviour to discuss the development of a patient decision aid.

Education

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

The Urgent Neurology Clinic

Program Lead: Dr. Alexandra Hanson

Overview



Dr. Alexandra Hanson

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 receive 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.

Highlights

For the calendar year 2014, the Urgent Neurology Clinic received a total of 3,211 referrals. (Approximately half were appropriate for the clinic.)

There were 539 clinics for the year (FMC: 330, SHC: 209). A total of 1,486 new patients were seen between the two sites (FMC: 959, SHC: 527). Eighty-one per cent of these were seen within one week of their referral.

The Urgent Neurology Clinic continues to work closely with Neurology Central Access and Triage to ensure all patients are seen in the appropriate neurology clinic. Ultimately, the goal is for a seamless continuum between the Urgent Neurology Clinic and the General Neurology Clinics.

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

Members

Physicians

FMC:

Dr. Philip Barber, Dr. Jodie Burton, Dr. Paula de Robles, Dr. Tom Feasby, Dr. Sarah Furtado, Dr. Alexandra Hanson, Dr. Jagdeep Kohli, Dr. Justyna Sarna, Dr. Tim Watson, Dr. Michael Yeung

SHC:

Dr. Farnaz Amoozegar, Dr. William Murphy, Dr. David Patry, Dr. Dawn Pearson, Dr. Gerald Pfeffer, Dr. Suresh Subramaniam, Dr. Katie Wiltshire, Dr. Chris White

Nurses

FMC: J. McNamara

SHC: L. Sorge

Administration Support

FMC: D. Gyonyor, C. Sanchez

SHC: C. Polehoyki

Pediatric Neurosciences

Dr. Jong M. Rho

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

Dr. Jong M. Rho leads over a dozen faculty child neurologists and an extensive team of trainees and Allied Health professionals. Excellence in clinical care and research spans all elements of child neurology including epilepsy, neurotrauma and stroke, neurocritical care, headache, demyelinating and other neuro-immune conditions, neonatal neurology and brain malformations, neuromuscular and movement disorders, as well as developmental and cognitive, neurogenetic and metabolic disorders.

Clinical Care

Round-the-clock urgent care is provided through inpatient on-call service and outpatient urgent neurology clinics. Integrated collaborations across multiple pediatric specialities provide comprehensive, cross-disciplinary diagnosis and treatment. ACH Pediatric Neurology has provided more than 700 inpatient consults and over 4,000 outpatient clinic encounters annually.

Education

Our RCPSC Residency Training Program remains fully accredited, has grown to nine residents (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 post-doctoral 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.

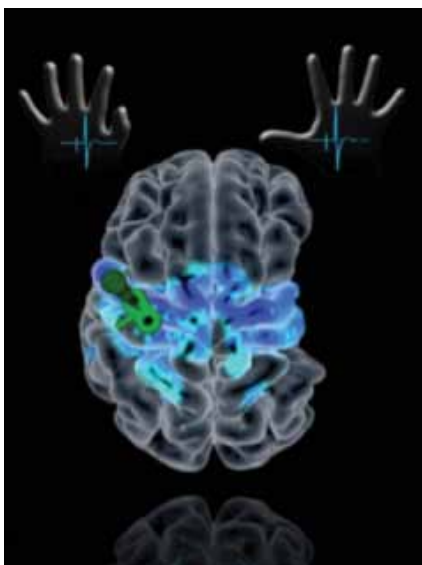
Research

Supported by the Alberta Children's Hospital Research Institute (ACHRI) for Child and Maternal Health, the Department of Pediatrics, the Alberta Children's Hospital Foundation, and the Hotchkiss Brain Institute (HBI), our section continues to experience significant academic growth. Major operating and program grants are held from agencies including CIHR, NIH/NINDS, AIHS, Brain Canada, HSFC, NeuroDevNet, CIPRF and ACHRI.

For the 2014-2015 academic calendar year, the Section of Pediatric Neurology received \$2.7 million in research funding for direct costs, published 84 peer-reviewed scientific papers, and continued to play major leadership roles in numerous national and international professional societies.



Dr. Jong M. Rho



The Calgary Pediatric Stroke Program (CPSP), directed by neurologist Dr. Adam Kirton, is comprised of a dedicated clinical and research team that provides state-of-the-art diagnosis, treatment, education, and support while pioneering cutting-edge research initiatives.

The CPSP has had a remarkable year, building upon steady growth and success in major international research networks, advanced neuroimaging, and non-invasive brain stimulation.

In 2015, Dr. Kirton was awarded a prestigious seven-year, \$2.8 million Canadian Institutes of Health Research Foundation Grant. Additionally, the Alberta Perinatal Stroke Project, founded within the CPSP, and boasting the world's largest population-based perinatal stroke cohort, was the recipient of the 2015 Alberta Health Services President's Excellence in Research Prize.

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.

Within the confines of 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 who 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 multidisciplinary spine care and 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 2,073 cases in 2014-15, with 1,895 operative cases at Foothills Medical Centre and 178 at Alberta Children's Hospital. There were another approximately 100 cases of bedside and Intensive Care Unit procedures, about 250 cases of endovascular procedures in the neuro-interventional suite, and roughly 100 radiosurgery cases.



Highlights

- We successfully recruited Dr. Jay Riva-Cambrin from the University of Utah School of Medicine to join our pediatric neurosurgery team at the Alberta Children's Hospital. Dr. Riva-Cambrin is well regarded for his surgical skill in pediatric neurosurgery as well as his expertise in leading multi-centre epidemiological studies, especially in hydrocephalus.
- Our academic highlight remains the Charles Taylor Memorial Lectureship that pays homage to Calgary's first neurosurgeon. In 2015, Dr. Ziya Gokaslan from the Johns Hopkins Hospital, was the 11th Annual Charles Taylor lecturer. Numerous respected professors and neurosurgeons visited our centre this past year.
- For the eighth 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 nerve surgery in a unique hands-on supportive environment using didactic and cadaveric methods. **(See story Page 30.)**

- Dr. Rajiv Midha was inducted in 2015 into the prestigious Canadian Academy of Health Sciences for his sustained basic science and clinical research contributions in nerve repair.
- Dr. Garnette Sutherland was awarded the prestigious NASA Exceptional Technology Achievement Medal for his seminal efforts in successfully translating space technology into a state-of-the-art robotic health care technology on earth.

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 16 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.





GOLD STANDARD TEACHING

Dr. Brad Jacobs, second from left, at the Spine and Peripheral Nerve Anatomy and Surgery Course..



Course provides unique opportunity for neurosurgeons

NEUROSURGERY AND ORTHOPEDIC RESIDENTS

from across Canada flock to Calgary every January for a unique spine course that can't be replicated in any classroom.

The Spine and Peripheral Nerve Anatomy and Surgery Course, which is preparing its ninth annual event January 6-8, attracts doctors from Nova Scotia to British Columbia, says course chair Dr. Brad Jacobs.

Hosted by the Calgary Spine Program, with the assistance of the Department of Clinical Neurosciences, the course has hosted over 100 participants since its inception.

"There have been lots of advances in surgical simulation models," says Dr. Jacobs, "but the gold standard remains that of cadaveric dissection."

Using cadavers allows each participant to practice complex procedures in a structured environment under the guidance of world-class surgeons and educators.

"There's a very low participant-to-anatomy specimen ratio, so they have extensive hands-on experience," he says.

"And there's also a very low instructor to participant ratio. In a sense, they almost have an instructor dedicated to their station."

Feedback has consistently been excellent.

And 2014 saw the course move to the new Advanced Technical Skills Simulation Laboratory (ATSSL), which is run jointly by the University of Calgary's Cumming School of Medicine and Alberta Health Services.

"It's a great new facility and it was reviewed really favorably by the participants."

In addition to video screens at each station, improved lighting and ventilation, the ATSSL does all the surgical instrumentation cleaning and processing in-house, he says.

For more information, visit www.ucalgary.ca/dcns/spine

Residency program is a family affair, says director

DR. JOHN HURLBERT, Director of the Neurosurgery Residency Program, has spent the past 10 years teaching and nurturing a family of talented surgeons.

"It's like watching your own children grow," he smiles.

The process is a very personal one for everybody involved, and the best part of his job.

The home that Dr. Hurlbert has created for residents was shaped by his own residency experience in Toronto—one of the largest programs in Canada.

"It wasn't unusual to go through six to ten years of training and not get to know all of the residents and even not get to know all of the attending neurosurgeons," he recalls.

It was intimidating for young residents, though the size of the program ensured the clinical experience was very rich.

After training, Dr. Hurlbert came to Calgary, but residency wasn't on his radar.

Dr. Terry Myles was the director and the residency program was doing very well. "The residents adored him."

Dr. Hurlbert was about 10 years into practice when Dr. Myles stepped down and, he says, he was in the right place at the right time.

"There were only one or two of us here at the Foothills in Neurosurgery at that stage of our careers. I think it was a little bit fortuitous."

The responsibility of leading the program was not one he took lightly. He notes programs with residency training have a completely different character to them—something that helps define the entire program.

"It adds a whole big and important dimension to



Residency Program Director Dr. John Hurlbert with Administrator Patti Sullivan.

that program that becomes part of your persona; part of the collective identity of the program."

That collective identity has made Calgary one of the top programs in Canada and has put them in the envious position of being able to attract and train some of the brightest residents.

"It's very luxurious to be able to groom the candidates that you want and to watch them grow. I'd have to say that's the most rewarding part—watching these young, enthusiastic, passionate individuals go from opening a book to taking out a very complicated brain tumour."

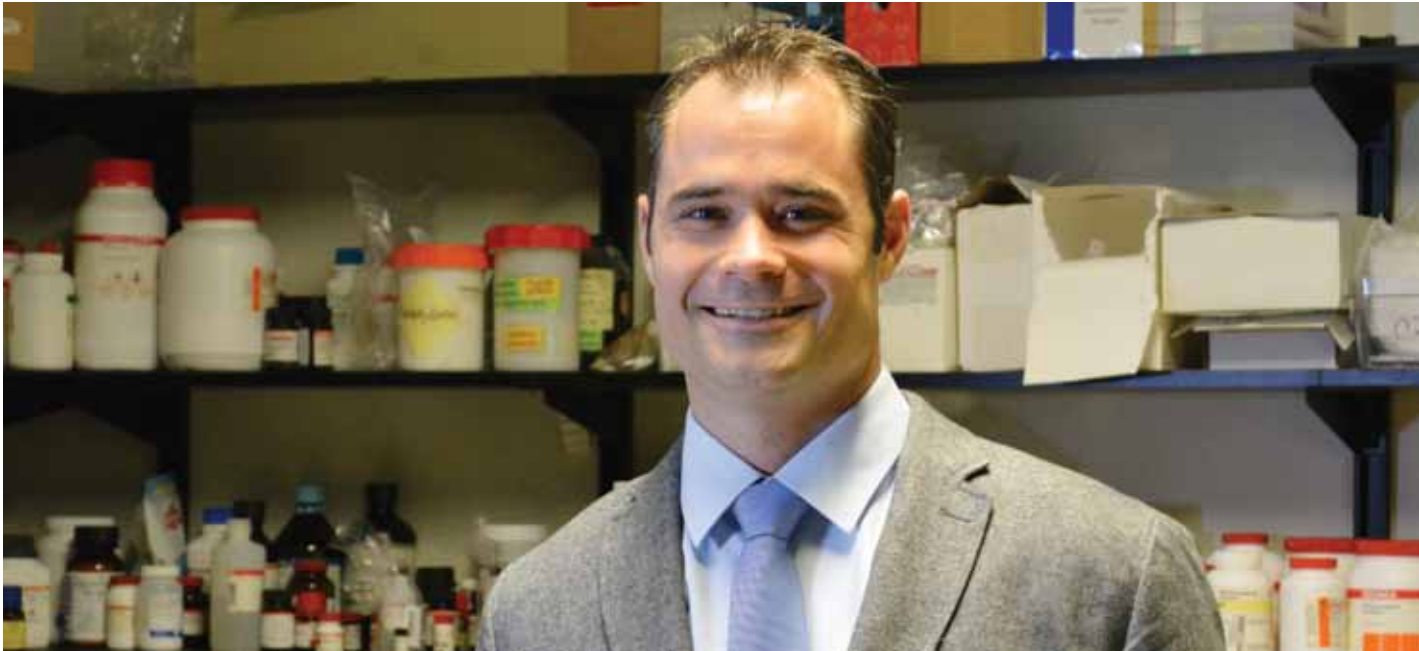
And when those shining stars finish the program, it's like watching a family member graduate and move on. "You wish you could hire them all, but jobs are an issue in Canada right now."

It may be frustrating to watch gifted Canadians leave to find work, but if we look at the world as a global community, says Dr. Hurlbert, they're going to do good things for a lot of people.

"And we live vicariously by watching their careers develop in their other locations."

Having had a hand in shaping all those careers has been in incredible privilege, he says.

"To help them become the neurosurgeons they can become—that's the best part of the job."



Neurosurgery resident Dr. Joey Grochmal, PhD, in the lab where he conducted his myelin research.

Resident takes detour to add PhD

NO ONE WILL EVER ACCUSE

Dr. Joey Grochmal of backing away from a challenge—especially when it comes to research.

After completing medical school at the University of Alberta, the neurosurgery resident started his Calgary training in 2006 and joined the Clinical Investigator Program in the fourth year (R4) of the six-year program.

But instead of the traditional one year of research that many residents opt for, Dr. Grochmal says he remembers thinking that, if he did two years instead he “would get more letters behind my name.”

Two years later he was getting excited about his research and rationalized that a couple more years for a PhD was justifiable.

“The two-year Masters ended up being a three-year Masters, and then the extra two years for a PhD ended up being an extra three years,” he laughs.

“It sounds like a long time, but it happens easily.”

His thesis—which was accepted and defended this year—involves the study of myelin in the peripheral nervous system.

“The basic premise of the research is very simple,” he says. “You put a dye on some myelin and it glows a certain colour.”

That colour, whether it looks red or orange or yellow, can give you clues about the state of health or disease of the myelin, he says, even if it appears normal using traditional techniques.

He compares it to astronomers deducing the composition of distant stars by measuring the light that they emit.

Though the research is not immediately applicable to clinical treatment, Dr. Grochmal says it’s an important building block for future research.

“As a neurosurgeon I could start to see applications for having a topically applied myelin dye,” he says.

Instead of relying exclusively on brain imaging before operating, a dye could highlight myelin fibres in a tumour in real time.

“By using the dye and a pair of 3D glasses, you could probably see the myelin while you’re operating.”

Dr. Grochmal, who worked closely with Dr. Rajiv Midha and Dr. Peter Stys, also hopes his work will help researchers studying diseases of demyelination, such as MS.

But, for now, he’s taking a break from research.

“You come into the program a young whippersnapper and I’m 35 now—I’m married with two kids.”

Technically an R10, he’s returning to full-time residency and looking forward to completing the program in 2017.

Alberta Radiosurgery Centre

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

Overview

This radiosurgery program was the first of its kind in Canada in using 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, it 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.

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. Rao Khan

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 2014, there were approximately 1,500 patients followed in the adult hydrocephalus clinic. There were approximately 900 outpatient assessments and 125 surgical procedures performed.

Highlights

- Startup of the Adult Hydrocephalus Clinical Research Network (AHCN). Dr. Hamilton is the Chair for AHCN which has two centres in Canada and four in the US. AHCN has enrolled approximately 200 patients in the past 10 months.
- 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 world Hydrocephalus experts discussing hydrocephalus care.

- Dr. Hamilton is a member of the Board of Directors and Secretary-Treasurer 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 joined the Medical Advisory Board of the Hydrocephalus Association.
- The development of a Canadian hydrocephalus strategy continues 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 with hydrocephalus. 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 Practitioners: Ron Prince, Lorna Estabrooks
Administration Support: Sandy Johnson

Image-Guided Medical Robotics Program

Program Lead: Dr. Garnette Sutherland

Overview

The Intraoperative MRI (iMRI) Program 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 1,800. Several years ago, this technology was spun into a company called IMRIS that now has 55 international sites with over 20,000 cases worldwide.

Into this environment we have integrated an image-guided robot called neuroArm. The robot has now been used in over 65 cases. Over the past several years, the commercial version called SYMBIS has been developed and recently received FDA approval for sales in the US centres.

Highlights

The project continues to expand.

This past year, the project was awarded a new grant entitled A Novel Neurosurgery-specific Haptic Hand-controller for Robot assisted Surgical Systems by CHRP-NSERC. Through this grant, we have been able to recruit an outstanding post-doctoral Fellow from Iran, Dr. Hamidreza Hoshyarmanesh, who will add to the research group's mechanical engineering expertise for the development of the proposed robotic system. Hamidreza will work closely with Project neuroArm chief engineer and now DCNS Adjunct Assistant Professor Kourosh Zareinia who leads the engineering division of this project.

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 begun to study the molecular genetics of meningioma, and brain tumour tissue interrogation using molecular characteristics, metabolism and vibration profile.

Our University of Calgary Eyes High Postdoctoral Fellow Dr. Yaser Maddahi, recently was awarded the prestigious Killam Fellowship for his ongoing 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.

Now in his second year of post-doctoral training, Ahmad Ghasemloonia, PhD mechanical engineer, has made considerable progress towards developing robotic toolsets as they relate to both head and neck surgery and neurosurgery. Through ongoing collaborations with Dr. Joseph Dort, Head and Neck Surgery, Dr. Ghasemloonia works with clinicians, engineers and scientists towards the design and development of an articulated wrist tool for robotic surgery. Furthermore, Ahmad, together with the team members at Project neuroArm, and Microscopy and Imaging and Microscopy Facility, has developed a novel method of interrogating cells and tissues through detection and analysis of their vibration signals.

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 begun preliminary work towards identifying select surgical cases, fusion of CT imaging data on to his software algorithm and producing a patient specific brain tumour simulation program for planning and performance of surgery. Neurosurgery resident Dr. Andrew Ryu, and Otolaryngology resident Dr. Justin Lui, have assumed the clinical counterpart in providing both knowledge and feedback. Related to the project, Andrew Ryu was successful in obtaining an AIHS clinical Fellowship award to pursue this collaborative research at UC Berkeley.

Reflecting the expanding multi-disciplinary environment, Project neuroArm also held its first Summer Students' Research Symposium on Aug. 11, 2015. Co-ordinated and chaired by Kourosh Zareinia, and co-chaired by Sonny Chan, presided over by Garnette Sutherland and Joe Dort, this summer students' presentations half-day allowed each student the opportunity to share their work with the group, peers, collaborators and associates. The students of diverse backgrounds and department affiliations came together to enthusiastically and confidently present their work and field questions and critiques in a most constructive and collegial platform.

In the latter half of the day, summer students

with ongoing work / involvement in the lab viz. Jade Huang, Jordan Huang and Matthias Park participated in various capacities with displays and demos of the project's virtual reality simulation software programs.

Recognition

In July 2015, in the recognition of the projects achievement and international visibility, Dr. Garnette Sutherland was awarded the NASA Exceptional Technology Achievement Medal 2015.

Education

International Tractography Workshop: In February 2014, Project neuroArm consolidated a collaboration with the University of Vienna towards the establishment of the first International Tractography Workshop in North America. The workshop, chaired by Dr. Garnette Sutherland and co-ordinated by Dr. Sanju Lama, hosted 12 participants, including neurosurgeons from North and South America and faculties from the University of Vienna. The workshop will be held every two years, currently underway for March 2016.

NeuroNight: To explore potential collaborations, Project neuroArm hosted an evening open-house event to showcase neuroscience technologies developed or being developed by Project neuroArm and Stryker Corporation. The evening brought together faculty residents and nurse clinicians of the Departments of Clinical Neurosciences and Surgery, together with policy makers and engineers from Stryker. The event will be held every two years, currently underway for May 2016. In addition to the evening technology display forum, we are planning to include a day course of hands-on use of contemporary and advanced technologies for surgical exposure and approach.

Microvascular Bypass Course: With the addition of Dr. Taku Sugiyama, microvascular surgeon from Hokkaido University, Sapporo, Japan, this year the project will hold a hands-on microvascular dissection-bypass course targeting the neurosurgery residents in Calgary. The course is based on an in-depth comprehensive tutorial developed by Sugiyama and his colleagues in Hokkaido University, Sapporo Japan.

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 the engineering lead from Dr. Kourosh Zareinia, Project neuroArm Chief Engineer, and Dr. Garnette Sutherland heading the neurosurgical aspect, we propose to utilize our considerable experience in both medicine and engineering to design and develop a neurosurgery specific haptic hand-controller. Such a hand-controller is need-based and is not presently available. Intellectual property arisen from the project will allow creation of a spin-off company and jobs 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, PhD candidate provided 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 traumatic brain injury that does not presently exist. This research direction 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 rooms. With the addition of Dr. Dustin Proctor, Molecular Biology-Neuroscience, this leg of the project is greatly strengthened with now expanding to molecular characterization and interrogations of brain tumours.

Cell Vibration: In collaboration with the Microscopy and Imaging facility, Dr. Matthias Amrein, we have begun the novel process towards interrogating tissue based on cellular vibration signature. Utilizing a unique Atomic Force Microscopy set-up, this project has conducted studies on neuronal cells and tissues. Tissue samples obtained from patients with brain tumours and epilepsy provided information on the vibration patterns of different cells and tissues, allowing differentiation between tissue types.

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Force-sensing Bipolar Forceps: For the last three years, the research group has designed the placement of strain gauge sensors on to surgical bipolar forceps (SmartForceps). This allows measurement and quantification of tool-tissue interaction. The project has progressed from pre-clinical testing, to now conducting pilot clinical testing. The project led by Liu Shi Gan, PhD Biomedical engineering, has been greatly strengthened by the addition of Dr. Taku Sugiyama from Japan. Through Dr. Sugiyama, the project is solidifying collaborations with Japan.

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.

Members

Engineering: Kourosh Zareinia, Liu Shi Gan, Yaser Maddahi, Ahmad Ghasamloonia, Hamidreza Hoshyarmansh, Mahdi Tavakoli, Chris Macnab, Qiao Sun, Yaoping Hu, Salvatore Federico

Science: Dustin Proctor, Sonny Chan, Christina Sutherland, Boguslaw Tomanek, Calvin Bewsky, Roger Mackenzie, 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, Garnette Sutherland

Administration Support: Alison Shepherd

Industrial Partners

MDA (Brampton, ON)
Deerfield-IMRIS (Minnetonka, MN)
Stryker (Kalamazoo, MI)
Medtronic (Minneapolis, MN)

Neuromodulation Program

Program Lead: Dr. Zelma Kiss

Overview

Neuromodulation is the altering/modulation of the 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 refractory depression, spinal cord injury, headache, spasticity, gastroparesis and urinary incontinence. Other sections within DCNS, as well as specialists from many other departments, are part of the program.

Clinical Care

A highlight of this year was the implantation of a first-in-Alberta diaphragmatic pacing system with a multidisciplinary team from physiatry, respiratory, thoracic surgery and the Carewest Dr. Vernon Fanning Centre. **See story Page 48.**

The sacral nerve stimulation (SNS) program continues to be a unique clinical service in Western Canada. They assessed 11 new patients, implanted three and revised one.

The movement disorders program received 64 new referrals, implanted 15 patients, replaced 11 batteries and followed 129 people in total. The Chronic Pain Centre (CPC) pain program welcomed a new member, Dr. Jenni Joo, a pain anesthetist recently trained in Ottawa. The program received 15 new referrals, implanted or trialed six new patients and follows many others with implanted devices.

The deep brain stimulation (DBS) for treatment resistant depression program implanted six people, all of whom are proceeding through our AIHS funded clinical trial looking for imaging and other biomarkers of responsiveness. Three of these six patients are in remission and the first patient from last year remains so >18 months after surgery.

Education

Our training program attracts residents, summer and graduate students, and post-doctoral Fellows. Linda Kim defended her MSc and decided to stay on to

pursue a PhD. A new post-doctoral Fellow, Dr. Elliot Brown, started in May 2015 and immediately obtained a Mathison Fellowship. Dr. Darren Clark obtained a three-year AIHS Fellowship. We look forward to welcoming Dr. Philippe Magown, the new stereotactic and functional neurosurgery Fellow for the 2015-16 academic year; he already obtained a Neurosurgery Research and Education Fellowship from the American Association of Neurological Surgeons.

From the nursing perspective, the movement disorder surgery nurses attended a training session in July 2014 to learn about new aspects of DBS technologies. One of them, Karen Hunka, also presented a session on DBS to the Parkinson Alberta conferences in Edmonton and Calgary in March and May 2015. Movement disorders, pain and ACH Allied Health presented a mini-symposium about neuromodulation at the CANN Regional Education Day in February 2015.

Research

We published papers on gastric neurostimulation for diabetic gastroparesis in the Canadian Journal of Gastroenterology and Hepatology, DBS for depression in the World Journal of Biological Psychiatry, the long-term effects of thalamic DBS for tremor in Frontiers in Human Neuroscience, the engineering aspects of using optical imaging in the setting of DBS in IEEE Transactions on Biomedical Circuits and Systems, and motor cortex stimulation for pain as part of a multicentre trial in the Canadian Journal of Neurological Sciences. The SNS program performed a clinical audit of all charts and submitted a multicentre paper to the Journal of Urology on the Canadian Perspective on the Economic Evaluation of Sacral Neuromodulation in Over Active Bladder.

Our team members had poster or oral presentations at Biological Psychiatry, Society for Neuroscience, Congress of Neurological Surgeons, Biomedical Circuits and Systems, International Society for Magnetic Resonance in Medicine, World Haptics Conferences and the Royal Ottawa Hospital.

Future Directions

We are still developing a new web-based secure

database for movement disorder surgery patients with the support of Rose Family Funds and the Hotchkiss Brain Institute. We have completed half the accrual required for our AIHS CRIO Project on DBS for treatment-resistant depression. Our cohort study of occipital and peripheral regional stimulation continues to enroll patients with headache and other craniofacial pain syndromes. In the coming year we look forward to using non-invasive neuromodulatory techniques (e.g. transcranial magnetic stimulation) to screen patients for these implantable therapies and thus provide more options for patients and develop new research projects.

Members

Cardiology: Dr. Jim Stone

Gastroenterology: Dr. Christopher Andrews,
Dr. Phil Mitchell

Neurology: Dr. Werner Becker, Dr. Scott Kraft,
Dr. Neelan Pillay, Dr. Jong Rho, Dr. Sam Wiebe

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

Nursing: Cheri Gray, Colleen Harris, Kara Hallett,
Deb Hartlieb, Brittany Hoffarth-Palchewich,
Karen Hunka, Jackie Martini, Valerie Sherwood,
Pia Lawrence, Raj Parmeer, Meredith Wild

Pain physicians: Dr. Jenni Joo, Dr. John Pereira,
Dr. Kelly Shinkaruk, Dr. Chris Spanswick
(Chronic Pain Centre)

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

Physiotherapy: Cliona Corbett

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

Psychology: Dr. Arlene Cox, Dr. Angela Haffenden

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

Urogynecology: Dr. Shuhana Kim-Fine,
Dr. 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 stays in hospital. 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 250 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 Calgary-led international multi-centre study of acute stroke intervention (ESCAPE).

Members

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

Nursing: Leslie Zimmer, Michelle Gillies

Fellows: Dr. Somar Chehab, Dr. Zarina Aziz

Pediatric Neurosurgery Program

Program Lead: Dr. Walter Hader

Overview

The Pediatric Neurosurgical 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. Mahmoud Benour, former pediatric neurosurgery

Fellow and resident of the University of Calgary joined the group as a locum in June, 2014.

Recruitment for a full time clinician scientist was completed in the spring of 2015. Dr. Jay Riva-Cambrin, a clinical epidemiologist and pediatric neurosurgeon trained at the University of Toronto and active member of the international Hydrocephalus Research Network, is expected to join the section in the summer of 2015.

Thanks to a generous gift from Bob and Brenda Macneil through the Alberta Children's Hospital Foundation, pediatric neurosurgery acquired the first dedicated Neurosurgical Robot in Canada for children. ROSA aids in the investigation of

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 continues to expand its scope at the South Health Campus, with a full-day clinic once a month.

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 go to: www.hbi.ucalgary.ca or www.ucalgary.ca/spinalnerve.

pediatric intractable epilepsy patients by the precise implantation of intracranial depth electrodes through minimal incisions resulting in greater precision in accessing deep targets while providing improved patient comfort.

Research

Publications over the past year have been in the areas of neurocognitive outcome of endoscopic third ventriculostomy in pediatric hydrocephalus and successful treatment of primary intracranial sarcomas with ICE chemotherapy and focal radiation in children. The Pediatric Neurosurgery section is an active participant in the Canadian Pediatric Neurosurgery research study group.

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 Khounq (2010-12),
Dr. Ferry Sanjaya (2011-12),
Dr. Chandan Mohanty (2012-2013),
Dr. Tarek El Madhoun (2014)
Dr. Yuval Shapira (2015)

Members

Medical Neurologists, Psychiatrists & Electrodiagnostics:

Dr. Chris White, Dr. Stephen McNeil

Neurosurgeon

Dr. Rajiv Midha

Plastic Surgeons

Dr. Christiaan Schrag, Dr. Robertson Harrop

Physiotherapy

Margaret Hass

Intraoperative Electrophysiology Support

Michael Rigby, Erin Phillip

Dr. Gallagher continues to participate in an international collaboration assessing cerebral energy metabolism in injured and uninjured brains utilizing novel techniques of MR spectroscopy.

Members

Neurosurgeons: Dr. Walter Hader,
Dr. Clare Gallagher, Dr. Mahmoud Benour

Pediatricians: Dr. Heather Graham,
Dr. Keith Jorgensen

Nurse Practitioner: Kelly Bullivant

Nurse Clinicians: Valerie Sherwood, Linda Gill

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.

Highlights

- Our combined neurosurgery/neuro-ophthalmology new patient and followup clinic have reduced clinic visits for many patients.
- David Adair has embarked on his Masters of Science to develop a novel image guidance system for endoscopic pituitary surgery.
- 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 (with the Department of Anesthesia) the assessment of post-operative nausea and vomiting in this patient population.

In June 2015, Dr. Andrew Ryu was awarded a Best Resident poster prize by the Canadian

Neurosurgical Society for his presentation entitled "Natural History of the Anterior Visual Pathway After Surgical Decompression in Patients with Pituitary Tumours" at the Canadian Neurological Sciences Federation annual meeting held in Toronto, ON.

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.

Education

The program offers Fellowship training to neurosurgeons.

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 for patients with brain tumours 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 to this, 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. Jay Easaw,
Dr. Paula de Robles, Dr. Greg Cairncross

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

Nurse Clinician: Crystal Tellett

Research Associate: Ish Bains

Research

Specific research initiatives include:

- clinical epidemiology, image guidance, robotic surgery, and surgical simulation;
- comparison of outcomes following different endoscopic approaches to pituitary tumours;
- a retrospective analysis of postoperative nausea and vomiting following endoscopic skull base surgery; being performed in collaboration with the Department of Anesthesia.

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 Section of Physical Medicine & Rehabilitation

Section Head: Dr. Chester Ho

THE SECTION OF PM&R HAS 26 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) to 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.

In memoriam – Dr. Pam Barton

- In January 2015, Dr. Pam Barton unexpectedly passed away. She was a senior member of our section, and a national leader and expert in chronic pain management. Dr. Barton co-founded the nationally renowned Calgary Chronic Pain Centre in 1997, and she also held numerous leadership positions in Physical Medicine & Rehabilitation in Canada. Her untimely passing was a shock and a huge loss to the PM&R community in Canada, and we have lost an outstanding colleague and friend. Our section is grateful for her contribution to the field of PM&R and we will truly miss her.

Recruitments

- Dr. Chris Grant joined our section in 2015 as Clinical Assistant Professor. Prior to his arrival, Dr. Grant was on faculty at the University of British Columbia Division of PM&R. He was recruited to build a critical care and trauma rehabilitation program in Calgary. Dr. Grant is based at the Foothills Medical Centre and provides PM&R consultations at the Peter Lougheed Centre. **See story Page 49.**
- Dr. Jordan Raugust and Dr. Vishal Tulsi joined our section in 2014 as Clinical Assistant Professors. They are graduates of our residency program. Both Dr. Raugust and Dr. Tulsi are based in the community, and they have a special interest in musculoskeletal rehabilitation and EMG. They are actively involved with our education program, and are collaborating with the Section of Neurosurgery in the re-design of the FMC Spine Clinic.
- Dr. Brent Edwards (Assistant Professor, Faculty of Kinesiology) was appointed as Adjunct Assistant Professor in 2014. Dr. Edwards has a special interest in bone and tissue health after spinal cord injury. This adjunct appointment facilitates his spinal cord injury rehabilitation research, and further enhances the collaboration between PM&R and the Faculty of Kinesiology.



- Katie Churchill, Senior Practice Lead in Occupational Therapy for Alberta Health Services, was appointed as Adjunct Lecturer in June 2015. Ms. Churchill is a leader in Occupational Therapy in Alberta Health Services. Her appointment will facilitate research development with PM&R and Allied Health professionals.

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. Les LaPlante and Dr. Serge Mrkobrada) passed the Royal College exams, maintaining the 100 per cent pass rate for the PM&R residency program.
- The “Amputee Day” education conference was held in the Health Sciences Centre on May 28, 2015. It was co-hosted by Dr. Ken Lam and Dr. Gentson Leung. The day was a huge success and there were over 120 attendees, including physicians, medical trainees, rehabilitation therapists and prosthetics/orthotics specialists.
- The Calgary Brain Injury Program held the 5th Annual Meeting on March 4, 2015 to focus on innovation and best treatment practices in brain injury rehabilitation. This is an annual event which brings together hospital based and community care providers as well as survivors.
- Dr. Sean Dukelow and Dr. Ken Lam have been actively involved in the training of rehabilitation clinicians in the use of Functional Electrical Stimulation (FES) in Southern Alberta. FES training sessions have been conducted in Lethbridge, Medicine Hat as well as Calgary for therapists and therapist assistants.

Research

- Research grant application success – highlights of this year’s success include: Dr. Chester Ho’s “Building the Rick Hansen Alberta Spinal Cord Registry” grant (\$899,943 over three years)

by Brain Canada; Dr. Dukelow is a co-leader on “Evaluating the Economic Impact of Quality of Care of the Smart-e-Pants Innovation for Pressure Ulcer Prevention” Alberta Innovates Health Solutions Partnership for Research and Innovation in the Health System grant (\$750,000) over 3 years.

- Hotchkiss Brain Institute NeuroTeam leadership – two of our section members are co-leads of the Hotchkiss Brain Institute’s Neuro-teams: Dr. Chantel Debert (Traumatic Brain Injury) and Dr. Chester Ho (Spinal Cord/Nerve Injury & Pain).
- Research trainees – there are four post-doctoral Fellows, four PhD students, one master’s degree student, two undergraduate students, one summer student, and one high school student. Of note, Dr. Jennifer Semrau won an Alberta Innovates Health Solutions (AIHS) post-doctoral Fellowship, Jeff Kenzie won an AIHS MD/PhD Graduate Student Award, Lindsey Logan won both the NSERC Graduate Scholarship and an AIHS Summer Studentship Award.

Clinical Care

- Endoscopic diaphragm pacer implantation – as a result of the collaborative effort between PM&R, Respiriology, Thoracic Surgery, AHS and the Carewest Dr. Vernon Fanning Centre, the first endoscopic diaphragm pacer implantation in Alberta was performed at the Foothills Medical Centre in October 2014, with funding from the Neuromodulation Program. We plan to pursue further diaphragm pacer implantations in the future. **See story Page 48.**
- An Early Supported Discharge program for patients with acquired brain injury was developed, with the first patient being enrolled in June of 2015. This is an innovative clinical service delivery model that has been modeled after the early supported discharge program for patients with stroke. Early indicators are that this has been very well received by both patients and their families, shortening hospital length of stay for patients with acquired brain injury.



ER physician Dr. Ian Rigby looks on as Schulich School of Engineering students Dave Morin and Courtney MacDonald demonstrate their team's entry into the 2015 Capstone Design Fair.

Schulich students rise to challenge with wheelchair assist device

STUDENTS FROM THE SCHULICH SCHOOL OF

Engineering addressed a common issue faced by wheelchair users as their final project before graduating—and in the process were recognized at the 2015 Capstone Design Fair.

The annual fair showcases and celebrates the projects of Schulich engineering students in their final year of the program.

The engineering problem was identified by the Spinal Cord Injury Program and ER physician Ian Rigby—a quadriplegic wheelchair user—who challenged the students to try climbing into a wheelchair from the floor without using their legs.

“The problem came from some of my experiences having come out of hospital with a few unceremonious dismounts on the pavement,” says Dr. Rigby.

“I found that it was fairly entertaining to get back into the chair—some of the time successful; some of the time with my wife lifting. It was eye-opening for sure.”

Dr. Rigby, who worked with physiotherapists Jackie Kilgour and Leanne Pierson on the project, hopes the device might one day benefit users who experience falls and can’t get themselves back into their chairs.

“The target users are people who are at least high-level quadriplegic—people with triceps function or better,” he says.

After numerous designs and weeks of fabricating and testing, the six engineering students built a prototype that includes a small seat that can be gradually ratcheted up a steel incline into the wheelchair.

“Instead of one step,” explains engineer Dave Morin, “you’re able to do a whole bunch of steps on the way up.”

“The problem came from some of my experiences having come out of hospital with a few unceremonious dismounts on the pavement.”

— Dr. Ian Rigby, ER physician and Capstone Design Fair mentor

A small spring in the system pulls the seat up a notch or two as users slowly lift themselves.

“The tension system is not enough to pull you up, but it’s enough to pull the seat up by itself so you just need to lift your bum a little bit and it will raise it up,” says Morin.

When not required, the bar and seat can be stored underneath and behind the wheelchair.

Though the materials are still being optimized to make them lighter, engineer Courtney MacDonald says the design is solid.

“We had a lot fun manufacturing the seat—it’s bulletproof. It will support any weight at any point because of the ratchet system.”

The engineering team, which also included Samuel Arulnathan, Joshua Herauf, Mico Madamesila and Yifan Wang, took first place in the mechanical and manufacturing division.

Innovative procedure has patient breathing easier

Story by Greg Harris
Photo by Paul Rotzinger

HEADING OUT TO THE LOCAL theatre to catch a movie is an entertainment option most of us take for granted.

But for Charles Nixdorff, a quadriplegic, taking in a film without being tied to his ventilator has been out of the question—until now.

In the first procedure of its kind performed in Alberta, Nixdorff, 57, has had a pacing device implanted in his diaphragm, which lets him breathe during the day without the help of the ventilator.

Since the surgery last October, the resident at Carewest's Dr. Vernon Fanning Centre in Calgary has even progressed to a point where he is able to breathe for up to 40 minutes entirely unassisted.

"I like to avoid the ventilator as much as possible," says Nixdorff, whose injury occurred when he fell down some stairs and struck his head while trying to move a chair.



Charles Nixdorff with Respiratory Therapist Gwen Dunn.

"This is something of a test case and we'll be watching closely to see how Mr. Nixdorff progresses."

— Dr. Chester Ho,
Physical Medicine
and Rehabilitation
Section Head

"It's much more natural to be on the pacer. This is definitely an improvement."

Called the NeuRx Diaphragm Pacing System, the unit provides an electrical impulse to stimulate the diaphragm just as a cardiac pacemaker provides

an impulse to stimulate the heart muscle. The diaphragm pacer is controlled by an external device, which can regulate the frequency of breaths, their depth and their duration.

Dr. Chester Ho, head of Physical Medicine & Rehabilitation at Foothills Medical Centre, spearheaded the pacer insertion, which included financial support from Alberta Health Services (AHS), through the Neuromodulation Program in the Department of Clinical Neurosciences.

"This is something of a test case and we'll be watching closely to see how Mr. Nixdorff progresses," says Dr. Ho. "Our hope is that he continues to increase the amount of time during the day he is on the pacing device."

Pacing devices reduce the risk of infection and irritation to airways, as well as enhance safety and

mobility, since patients aren't attached to any tubing. Patients in an institutional setting remain on the ventilator at night as a safety precaution.

Dr. Karen Rimmer, an AHS respirologist who provides care to Nixdorff and other patients on ventilators, says there are relatively few suitable candidates for the pacing device.

"It all depends on the type of injury they've had," Dr. Rimmer says. "The phrenic nerve, which powers the diaphragm, must still be intact in order for this therapy to work."

Although this form of therapy has been used in the U.S. and some European countries, it's still relatively new to Canada with only a handful of centres having performed the procedure.

The pacing device is implanted via laparoscopic surgery and is connected externally to a handheld control system.

Although it takes time for a patient's phrenic nerve and diaphragm to regain conditioning, some patients do extremely well and are eventually able to breathe unassisted.

"The device has improved Charles' quality of life in that it has given him more confidence," says Beverley Forbes, Carewest client service manager at the Fanning Centre. "When you're relying on a machine to breathe, you realize how dependent you are. But the pacing device offers some independence from that."

The improvements brought about by the pacing device have been significant, one example being the recent ventilator-free outing to the cinema.

Physiatrist taking rehab into uncharted territory

PHYSIATRIST DR. CHRIS GRANT

is accustomed to working in difficult environments.

He began his career in computer science and moved to Silicon Valley as the dot-com bubble was bursting.

"Everybody was fleeing the Valley," he recalls. "I couldn't move out because there were no U-Haul trucks available."

Fortunately for the Department of Clinical Neurosciences, he made it out of California and switched careers after completing a medical degree and the Physiatry Residency Program at the University of British Columbia.

His current home in the Trauma and Critical Care Departments at Foothills Medical Centre, however, ensures he's still on his toes.

Dr. Grant is working with Critical Care patients to determine how they recover once they leave the unit and how rehabilitation can help those who traditionally don't get referred to physiatrists.

Studies in the 1990s, he explains, found that respirology patients may return to normal pulmonary function after six months and may be off oxygen after one year—but that wasn't the entire story.

"Fifty per cent of people didn't get back to work," says Dr. Grant. "There were huge rates of delirium, post-traumatic stress disorder, muscle and nerve dysfunction—which was not really addressed by anybody."



Dr. Chris Grant

He aims to assist some of those populations who don't traditionally visit a physical medicine specialist during their hospitalization.

For example, he says, a patient with a serious post-operative infection often won't end up in front of rehab services "even though those are some of the most complex, severely injured people out there."

As a result, Dr. Grant is designing rehab strategies that can be implemented in intensive care units to avoid muscle loss (even in patients on ventilators or dialysis).

Let's try to prevent the atrophy, he says, "instead of trying to rebuild muscle strength after the fact."

The results from studies in the U.S. are encouraging, he says. "Hospital lengths of stay are shorter. ICU lengths of stay are shorter. Patient satisfaction is higher."

Residency Director says program gives everyone a role in teaching

WHEN DR. STEPHANIE PLAMONDON took over as only the second Residency Director of the Physical Medicine and Rehabilitation program in 2008, she freely admits she didn't know what she was getting into.

"I expected it to be challenging—and it was—but in a very good way," she recalls.

But those challenges, says Dr. Plamondon, came with plenty of support from Dr. John Latter, who founded the residency program and was also section head at the time.

"Even now, Dr. Latter is still helping out," she says.

"He's been great at encouraging me and giving me a lot of advice."

It may have been daunting at the beginning, but the physiatrist credits the support she received from the Postgraduate Medical Education office and other residency programs for her success.

Over 20 residents have entered the program since it began in 2003—beginning with Dr. Lee Burkholder.

"Lee was a great resident because he was willing to take a chance on us and he was a strong role model for others to follow," says Dr. Plamondon.

After graduating, Dr. Burkholder left to do a Fellowship in pediatric rehabilitation and has now returned to be a member of the section.

The program quickly added two more trainees, Dr. Arun Gupta and Dr. Darren Gumbs, and flourished. The trio paved the way for all the other residents who have followed, says Dr. Plamondon.

"They learned from us but they also learned so much from each other."

At the same time, the Section of Physical Medicine and Rehabilitation grew—tripling in size to almost 30 members—each contributing to the residency program in their own way.

"One of the reasons why it's doing well is because everybody had a lot of input and we were willing to try new things," she says.

For example, Neurology leaders Dr. Lara Cooke and Dr. Kevin Busche came to section retreats to host sessions on teaching skills.

"They taught not just the staff, but also the residents."

The teaching wasn't, however, exclusively from physicians.

"We work with Allied Health and the administration staff. Everyone is contributing and everyone has a role (in teaching)," she says.

But one of Dr. Plamondon's greatest tributes is reserved for then-program administrator Linda Jennett, who managed the program from the beginning with Dr. Latter.

"I would be nowhere without Linda," she says, crediting the well-known program administrator with always providing encouragement and continuously striving to improve the program.

"She's the 'Mama' and John Latter is the 'Papa' of the program," says Dr. Plamondon.

Today, the program attracts residents from across the country, in part because of the diversity of its training, including in pediatric rehabilitation.

And while Dr. Plamondon recently passed on the torch to new director Dr. Gentson Leung, she's confident the program will continue to thrive.

"Gentson's already starting to innovate—I can see it," she says.

"I think he'll be great for the program."

**Dr. Stephanie Plamondon in
the PM&R Residency Office.**



Celebrated physiatrist strived to find pain relief for patients

DR. PAMELA BARTON

Apr. 25, 1951 - Jan. 19, 2015

DR. PAMELA BARTON was a visionary in the field of Chronic Pain. In 1997, as co-founder of the nation's largest multi-disciplinary Chronic Pain Centre in Calgary, she brought light to the sometimes bleak outlook on the management of pain.

She understood the value of collaboration between physicians of varying backgrounds and the entire interdisciplinary team in treating those suffering from chronic non-malignant pain.

She was awarded substantial Alberta Heritage Foundation for Medical Research and CIHR grants looking at the utilization of resources for pain management and assessing the burden of chronic pain.

Being an expert in the management of complex musculoskeletal pain, Pam was devoted to educating herself, her colleagues and her patients about novel methods in treating and coping with pain.

She was heavily involved in developing Physiatry in Canada. She was a past president of the Alberta Physiatry Association and Vice President of the Canadian Association of Physical Medicine and Rehabilitation (CAPMR).

Pam's expertise as a teacher and her immense dedication to the Section of Physical Medicine and Rehabilitation, will be greatly missed.



Amputee Rehabilitation Program

Program Lead: Dr. Kenneth Lam

Overview

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 2014, 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.



Dr. Kenneth Lam

Highlights

The Amputee program is actively involved in limb loss prevention by partnering with multiple stakeholders including the Diabetes Strategic Clinical Network, and the Sheldon Chumir Wound Care Clinic.

By centralizing the outpatient amputee program at one site, 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.

The program is experimenting with a 3D printer for education and rapid prototyping.

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.

In 2015 the program held an Amputee day. Residents, Nurses and Allied Health attended it. The objective was to provide an overall view of all the services available in the management of the amputee and practical case studies. The day was very well received.

Members

Dr. Kenneth Kui Sai Lam
Dr. Gentson Leung

The Burn Rehabilitation Program

Program Lead: Dr. Vincent Gabriel

Overview

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,



Dr. Vincent Gabriel

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

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 various causes. The affected individuals have a wide spectrum of severity of injury from mild to severe. We have inpatient and outpatient services.

The inpatient service includes:

1. Consultation service for individuals with diagnosis of acquired brain injury in acute care.
2. Inpatient interdisciplinary rehabilitation service consisting of approximately 15 beds on Unit 58 at the Foothills Medical Centre.
3. An inpatient brain injury nurse co-ordinator who works closely with the physiatrists, nursing and Allied Health to facilitate rehabilitation and discharge planning for inpatients with a diagnosis of an ABI.

The outpatient service is based upon a centralized referral system which provides triage and access to several services including:

1. Brain Injury Rehabilitation Clinic which provides assessment and treatment by physiatrists for people with moderate or severe ABI. We have a psychiatrist associated with our clinic who provides consultations for us as required, and social workers who provide counselling and support.
2. Referrals for interdisciplinary rehabilitation at Community Accessible Rehabilitation (CAR) for individuals with ABI.
3. An acute concussion education program which consists of symptom management advice in a group format to individuals affected by concussion within three months of injury. No assessment is provided. We are in the initial planning stages with community partners for group education of individuals with persistent symptoms greater than 3 months post concussion.

4. A brain injury community case manager who works as a liaison between our program and other community services to assist individuals by providing navigation and support following ABI.

We have continued to see a steady increase in referral volumes since the start of our central triage system in late 2011. In 2014, we received approximately 1,050 referrals. Moving in to the third quarter in 2015, our central triage office had already received 1,000 referrals.

Service

We have an exciting new addition to our Brain Injury Program planned for clients requiring community rehabilitation following acquired brain injury. Our program has now developed a Brain Injury Early Supported Discharge (ESD) team which is an innovative model of delivering home and community based rehabilitation for this population. This concept had been explored extensively and published in the stroke population and has been implemented with great success, but will be new for the brain injury population. We anticipate the first client will be enrolled in the summer of 2015 and we are collecting data to continue to inform service delivery going forward.

The Cuming & Gillespie Patient Experience Team continues to support SynAPSE (SYNcing ABI Peer Support & Education), which is a one-to-one peer support service available to inpatients. Additionally, our team has recently developed a monthly group on our inpatient neuro-rehabilitation unit for patients and their families. This facilitated group provides them the opportunity to meet and connect with each other as they move towards integrating back into the community.

Education

The 5th Annual Calgary Brain Injury Program Event entitled "Reflect, Rework, Remap" was held in February 2015. This brought together nearly 100 stakeholders from local and provincial programs across the continuum of care. A keynote address focused on neuroplasticity and how to apply these concepts into daily clinical practice. The morning consisted of rapid podium presentations, along with over a dozen poster presentations. This established

the background for inter-professional concurrent workshops on cognitive rehabilitation, communication strategies, patient and family-centred care and vestibular rehabilitation.

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

Dr. Chantel Debert along with Jill Congram, our inpatient co-ordinator, and Dr. Philippe Couillard, critical care intensivist, delivered a panel discussion at the Trauma Association of Canada Annual conference in Calgary this April which included current developments in rehabilitation care. The discussion focused on the ethical challenges of delivering care from hyper-acute through to rehabilitation for a person with a severe ABI and was well received by the conference participants.

Grants and Research

Grants have been received from the Canadian Institutes of Health Research, the Department of Clinical Neurosciences, Alberta Health Services, the University of Calgary, and the Hotchkiss Brain Institute, totalling \$1,656,970.

Members

Managers: Jason Knox, Lynnette Fritzke,
Lisa Patel, Paul Wright

Community Case Manager: Heather Gillett

Inpatient brain injury co-ordinator: Jill Congram

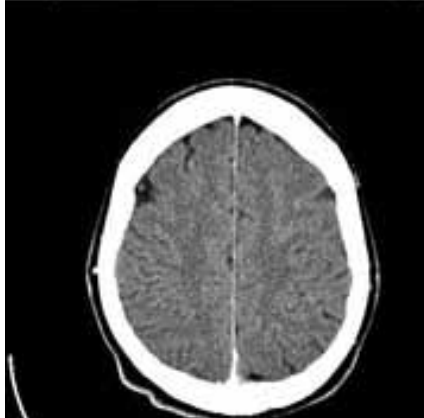
Physiatrists: Dr. Christine McGovern,
Dr. Rodney Li Pi Shan, Dr. Chantel Debert, Dr.
Christopher Grant

Psychiatrist: Dr. Jeremy Quickfall

Clinic Social Workers: Carol Lawson,
Valerie Bunz

Neuropsychologists: Stewart Longman,
Amy Siegenthaler

Administration Support:
Susan Morson, Kendra Ness



Pediatric and Young Adult Rehabilitation Medicine

Program Lead: Dr. Lee Burkholder

Overview

The program provides inpatient and outpatient rehabilitation medicine services 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 (MSK) disorders such as limb deficiency, rheumatologic conditions, sports injuries, chronic pain and biomechanical deficiencies at the Alberta Children's Hospital (ACH). 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.

Highlights

Dr. Burkholder was appointed the Medical Director of Rehabilitation Services, Vi Riddell Children's Pain and Rehabilitation Centre, in January 2015. Associated rehabilitation programming includes a comprehensive transition service that supports children and youth with disabilities to develop such skills as medical self-advocacy, vocational planning and community mobility as well as innovative Allied Health programs that significantly increase clinical capacities.

Dr. Raugust was welcomed to the program in September 2015; offering care through two new outpatient clinics at the ACH. The General MSK Rehabilitation Clinic is focused on non-surgical management of MSK issues such as sports injuries, chronic pain and biomechanical deficiencies. The Pediatric Rheumatology Sports and Exercise Medicine Clinic is an interdisciplinary clinic dedicated to managing children with rheumatologic disorders who are, or desire to be, physical active.

Clinical Care Updates

The Pediatric Rehabilitation Medicine inpatient consultation service assessed and treated 74 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 704 pediatric outpatient consultation and followup appointments through various ACH rehabilitation clinics. A further 265 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 nine 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 16 patients undergoing evaluation.

Education

Program educational pursuits were largely related to post-graduate medical training. The program had PM&R as well as Pediatric Neurology residents on service for 10 of 13 academic blocks. Dr. Gnanakumar is a member of the PM&R Residency Training Committee. She is also the physician lead for PM&R medical student clinical electives and was recognized by the section with an award for educational excellence in this role. Dr. Burkholder is a member of the Developmental Pediatrics Residency Training Committee.

Future Direction

Increased clinical capacity at ACH and introduction of new clinics continue to improve knowledge of Pediatric Rehabilitation Medicine with subsequent increases in demand for inpatient involvement and outpatient consultation. The program is committed to meeting this clinical demand in both the neurological and MSK rehabilitation domains. The program also intends to expand its research endeavors in collaboration with established research programs at the ACH and through the growing Vi Riddell Children's Pain and Rehabilitation Centre research programs.

Members

Dr. Lee Burkholder, Dr. Vithya Gnanakumar
Dr. Jordan Raugust

PM&R Musculoskeletal and Chronic Pain Programs

Program Lead: Dr. Noorshina Virani

The Evolution of Musculoskeletal Physiatry

Musculoskeletal Physiatry has grown leaps and bounds in the past 5 years. It started with a humble beginning as a small subsection in the Section of Physiatry within the Department of Clinical Neurosciences (DCNS). Its founding members included Dr. Perminder Ubhi, Dr. John Latter, Dr. Dan McGowan and Dr. Stephen McNeil along with a handful of others.

One member, Dr. Pam Barton, unfortunately passed away unexpectedly on Jan. 19, 2015. Dr. Barton was a strong advocate for Musculoskeletal Physiatry. Utilizing her sub-specialty training in pain medicine she complemented the services provided by others in Orthopedics surgery, General Surgery, Obstetrics/ Gynecology, Sports Medicine, Cardiology and Physiatry. Her passion to treat patients with various complex musculoskeletal disorders led her to becoming a founding member of the Calgary Chronic Pain Centre. The Calgary Chronic Pain Centre was founded in 1977 and is currently considered one of the leading inter-disciplinary pain clinics in North America.

Dr. Barton held both clinical and academic appointments at the universities of Western Ontario and Calgary. Additionally, she was an active member in the Canadian Association of Physical Medicine and Rehabilitation (CAPM&R). Dr. Barton held various leadership roles at both a local and national level including the Alberta Physiatry Association (APA) and the Alberta Bone and Joint Strategic Clinical Network (SCN).

Dr. Barton was a leader and mentor for many of the attending Physiatrists currently in the Section of PM&R (DCNS). She generously shared motivation and appetite for musculoskeletal medicine. As such, today we have a growing local sub-section with multiple projects at the tertiary care level, community clinics focusing on both academics and patient care.

Current physicians in Musculoskeletal medicine has more than tripled in the past five years. In fact, many members have a primary focus in musculoskeletal Physiatry.



A number of new clinics have been developed which greatly expand the role of a MSK Physiatrist. Clinical highlights include:

- Inter-disciplinary Spine and Musculoskeletal Clinics
- Interventional Spine and Sports Medicine Clinics
- Pediatric Sports Medicine Clinics
- Regenerative and Performance Medicine Clinics
- Running Injury Clinics
- Ultrasound for Musculoskeletal Medicine, Sports Medicine and Pain

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Community MSK Clinics	Lead Physician(s)	Focus
Advanced Spinal Care Centre	Dr. Arun Gupta	Interventional Spine and Sports Medicine
Aspen Physical Medicine and Rehabilitation	Dr. David Flaschner	Multi-disciplinary Pain and Electrodiagnostics
Catylst for Medical Health	Dr. Daniel LeBlond	MSK Medicine and Electrodiagnostics
Evidence Spine and Sports Physiotherapy	Dr. Tony Giantomaso	MSK and Pain Medicine
Kinesis Medical Centre	Dr. Raugust, Dr. Chiu, Dr. Huang, Dr. LaPlante, Dr. Tulsi	MSK Medicine and Electrodiagnostics
MSK Regeneration and Performance Centre	Dr. Arun Gupta	Regenerative MSK Medicine
Physical Medicine and Rehabilitation	Dr. Maryana Apel	Pain Management and Physical Rehabilitation
University of Calgary Concussion Clinics	Dr. Chantel Debert	Concussion Management
Programs		
Alberta Ballet	Dr. Arun Gupta	Head Physician
Alberta Children's Hospital Multidisciplinary Clinics	Dr. Lee Burkholder, Dr. Jordan Raugust	Consulting Physician(s)
Calgary Chronic Pain Centre	Dr. Noorshina Virani and the late Dr. Pam Barton	Consulting Physician(s)
PAMIA – Performing Arts Institute of Alberta	Dr. Arun Gupta and Dr. Noorshina Virani	Performing Arts Medicine
University of Calgary Sports Medicine and Varsity Program	Dr. Chantel Debert, Dr. Arun Gupta and Dr. Sean Dukelow	Consulting Physician(s)
Educational Highlights		
Calgary Pain Education Foundation	Dr. Arun Gupta, Dr. Noorshina Virani	Organizing Members – Past and Present
Canadian Interventional Pain Conference	Dr. Arun Gupta	Organizing Member
MSK SIG	Dr. Gupta, Dr. Leung, Dr. Plamondon, Dr. Raugust, Dr. Tulsi, Dr. Virani	Organizing Member – Past and Present
MSK Ultrasound Workshop	Dr. Raugust, Dr. Tulsi	Organizers

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 2014-15, 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 treated 53 persons with new SCI in the acute inpatient rehabilitation program.

There were 100 new patients and 685 outpatient visits in the SCI Physical Medicine & Rehabilitation Clinic during this period.

Collaboration between Physical Medicine & Rehabilitation, Departments of Allied Health and Respiratory Therapy at the Foothills Medical Centre has led to the development of a neuro-respiratory pathway that utilizes evidence-based approach to standardize the management of respiratory issues in persons with SCI in the acute neurosciences and rehabilitation units at the Foothills Medical Centre.

Alberta's first endoscopic implantation of the diaphragm pacer system was performed at the Foothills Medical Centre in October 2014. This allowed its recipient, who was dependent on mechanical ventilation due to his high level SCI, to be successfully weaned off of mechanical ventilation during the day.

As a result of our partnership with Spinal Cord Injury Alberta (SCI AB), Allied Health Department at the Foothills Medical Centre, University of Alberta Steadward Centre, University of Calgary Faculty of Kinesiology, Mount Royal University and philanthropic support through Calgary Health Trust, our city-wide, "acute rehab to community" Functional Electrical Stimulation (FES) cycling program enters Phase II, which included installation of a new FES bicycle at the University of Calgary

Faculty of Kinesiology. There is overwhelming demand for this exercise training modality in the community, and we plan to continue with its expansion in Calgary.

Education

With the support of the Craig Neilsen Foundation Quality of Life grant for "Multi-Modal SCI Patient Education Across the Care Continuum and the Lifespan" and the collaboration with SCI Alberta, the SCI Education Committee co-hosted the SCI Peer Conference, "Living Well With a Spinal Cord Injury", with SCI Alberta on September 19, 2014. The program was highly successful and was attended by nearly 100 people.

Three SCI team members presented at the Academy of Spinal Cord Injury Professionals annual conference in Las Vegas, NV, in September 2014. These attendees shared two scientific posters and two concurrent presentations with the multidisciplinary ASCIP attendees.

Research

Dr. Chester Ho was awarded a research grant by Brain Canada to develop a provincial SCI registry that will include both traumatic and non-traumatic SCI, with collaboration and support from the Alberta Paraplegic Foundation, Rick Hansen Institute, University of Alberta Institute Neuroscience & Mental Health Institute, and the University of Calgary Hotchkiss Brain Institute,

The SCI rehabilitation team continues to be part of the SCI Knowledge Mobilization Network (KMN) to facilitate pressure ulcer prevention best practice implementation at the Foothills Medical Centre.

Members

Dr. Denise Hill

Dr. Chester Ho

Dr. Dan McGowan

Dr. Gillian Simonett

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 through Community Accessible Rehabilitation (CAR), Association for Rehabilitation of the Brain Injured (ARBI), Early Supported Discharge (ESD), and other private rehabilitation facilities. We accept referrals from across southern Alberta for patients who require stroke rehabilitation expertise.

Highlights

This year our team was fortunate to have Dr. Christopher Grant join us. He is helping to provide support for individuals with stroke in the ICU and has been providing inpatient consultations at the Peter Lougheed Centre.

Further, Bonnie Poon, a physiotherapist has joined our team as the new Stroke Rehabilitation Co-ordinator to help with patient flow across the continuum.

Clinical highlights involved three functional electrical stimulation workshops. One workshop was held for therapists and assistants in the Calgary Zone, while two others were held in Lethbridge and Medicine Hat for therapists and assistants participating in the Cardiovascular and Stroke Strategic Clinical Networks Stroke Action Plan. Workshops were led by Dr. Lam, Dr. Dukelow, Stuart Miller and a team of therapists from across the Calgary zone. These workshops were targeted at integrating functional electrical stimulation into daily rehabilitation practice to promote stroke recovery.

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 nine papers last year. Dr. Dukelow was interviewed on CTV about the DOSE trial that the physiatry group is involved with. It explores the importance of aerobic exercise in stroke recovery.

Participation continued as a site in the Heart and Stroke Foundation of Ontario funded multi-centre EVREST trial examining the efficacy of virtual rehabilitation using the Nintendo Wii for the upper extremity.

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.

In the period of July 2014 to June 2015 a total of 152 new general physiatry outpatients and 399 repeat visits occurred in the Physiatry clinic area at Foothills.

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, neuromuscular 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 some Inpatient General Physiatry consultations provided mainly by Dr. Dan McGowan.

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. There were a total of approximately 185 Inpatient General PM&R and Neurological consultations over a 1 year period from all four acute care sites, including Peter Lougheed Centre, and Carewest Glenmore Park.

Some of the Physiatrists in the General Physiatry clinics continue to develop expertise in the use of ultrasound for visualization of nerve and musculoskeletal structures, and for guided injections. This innovative technology is rapidly moving to the forefront in Physiatry education and clinical practice, especially in the areas of musculoskeletal medicine, neuromuscular disease and spasticity management. Further research is very much needed in these areas to define its most appropriate and optimal use.

The Section of Translational Neuroscience

Section Head: Dr. V. Wee Yong

THE SECTION OF TRANSLATIONAL NEUROSCIENCE

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

Current active members of DTN include:

- **Dr. V. Wee Yong** is a professor whose laboratory is based at the HBI. He co-directs the Multiple Sclerosis (MS) Program of HBI, he holds the Canada Research Chair in Neuroimmunology and he is 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 clinical trials in MS and spinal cord injury. His research has been supported by Canadian Institutes for Health Research (CIHR), the Multiple Sclerosis 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 (α BC) 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 for Parkinson's disease research and a member of HBI. He currently directs a basic research laboratory and 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**, Professor, joined DCNS as Clinical Research Director, and the Department, HBI and the Cumming School of Medicine as the Research Director of the Movement Disorders Program, 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 are also being studied. Non-medication therapies such as transcranial magnetic stimulation and cognitive training are also being explored. His research is funded by CIHR, NSERC, and Parkinson Society Canada. **See story Page 64.**

Highlights

Dr. Yong was elected a Fellow of the Royal Society of Canada. He was inducted into the Order of the University of Calgary for his contributions to research, academia and university community. Dr. Yong's laboratory continues to publish key papers on how to harness the beneficial aspects of neuroinflammation, so that the promotion of regenerative processes can be enabled.

Dr. Nguyen sits on the Systems Neuroscience A grant panel at CIHR. Recently, he has been invited to sit on the Molecular and Cellular Neurosciences B grant panel and to participate as a Reviewer to the First Foundation Scheme Live Pilot from CIHR.

Dr. Ousman published a review article in the high impact journal *Nature Neuroscience* titled, Immune Surveillance in the Central Nervous System.

Dr. Hu was awarded \$750,000 to start a multi-centre study of Ambulosono, a sensorimotor

contingency-based music walking program for people living with Parkinson's disease.

In 2014, Dr. Monchi's laboratory published in the journal *Brain* the first longitudinal study showing in vivo with anatomical MRI that the early presence of Mild Cognitive Impairment in Parkinson's disease is associated with a faster neurodegenerative process than in cognitively healthy PD patients. In 2015, Dr. Monchi received a JELF fund from the CFI to establish his new laboratory with a main focus on TMS and neuroimaging in Movement Disorders and dementia. He was successfully nominated for the Canada Research Chair (Tier 1) in non-motor symptoms of Parkinson's disease.

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

Education

DTN 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 who suffer from neurological and mental disorders. In that light, work by our DTN members in collaboration with our neurology and neurosurgery colleagues have resulted in ongoing Phase III clinical trials in MS and traumatic spinal cord injury. A \$5 million team grant from Alberta Innovates - Health Solutions led by one of our DTN members and which includes several clinical colleagues has enabled us to begin clinical trials of potential remyelinating therapies in MS.

Researcher puts patients at the heart of movement disorders work

TRANSLATIONAL NEUROSCIENCE'S NEWEST MEMBER

is a researcher who likes to build things—and that's become very evident in his first year in Calgary.

Since arriving with his family from Montréal, Dr. Oury Monchi has instigated two major clinical studies into Parkinson's disease, organized a new NeuroTeam at the Hotchkiss Brain Institute, set up a research lab, and is founding a Parkinson's research network for patients.

And it all started with an ad for a Tourmaline Oil Chair in Parkinson's disease.

"I thought, they're probably looking for a neurologist, but I was curious," says Dr. Monchi. "So I sent an email with a very informal CV that was written in French."

Dr. Monchi, who did his Masters and PhD at King's College London, had been at the Centre de recherche, Institut Universitaire de Gériatrie de Montréal (CRIUGM), for 11 years and was looking for new challenges.

His joint role with DCNS and the HBI included two research chairs: the Tourmaline Chair and a recently awarded Canada Research Chair (Tier 1) in non-motor symptoms of Parkinson's disease.

But it was the straightforward mandate that attracted him to Calgary.

"Build what you think will be a great movement disorders research group in Calgary," he was told. "I like building!"

His first study is using neuroimaging and other biomarkers of cognitive decline in Parkinson's disease with the hope of being able to predict dementia very early.

At the same time, in a complementary study, Dr. Monchi is using transcranial magnetic stimulation (TMS) to explore a non-medication treatment for patients.

"The fact that patients feel somehow rewarded or useful by taking part in these studies is very touching to me."

— Dr. Oury Monchi

"The machine produces a very strong magnetic field for short periods of time and this is transformed into an electrical current in your brain," he explains.

By stimulating a very focused part of the brain, Dr. Monchi is hoping to help patients with their non-motor symptoms.

And if that wasn't enough to fill his days, he's begun building the Calgary Parkinson Research Initiative (CaPRI) to connect patients and researchers.

"It's not just a database," he says of the web site (www.capriresearch.org). It allows patients to contribute and lets researchers connect with their biggest supporters.

That patient contact, says Dr. Monchi, is very important for him.

"Research can be a bit of lonely game in a sense. The fact that patients feel somehow rewarded or useful by taking part in these studies is very touching to me," he says.

"At the end of the day, you want to make a difference for society and these patients."





Undergraduate Medical Education in Clinical Neurosciences

Co-Chairs: Dr. Gary Klein and Dr. Darren Burback

Evaluation Co-ordinator: Dr. David Patry

Anatomy Co-ordinator: Heather Jamniczky PhD

Course Co-ordinator: Kevin Johnston

Overview

Medical students are taught about the neurosciences and aging in the first course of the second year of the undergraduate curriculum during August and September each year. The neurosciences component is combined with content from geriatrics, otolaryngology and ophthalmology. 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. 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, Mr. Kevin Johnston

Resident Research Day

Annual event puts trainees in spotlight

RESIDENTS FROM ALL AREAS

of the Department of Clinical Neurosciences come together each November to celebrate an annual tradition.

The events, which draws a large audience in the Coombs Lecture Theatre at Foothills Medical Centre, highlights the residents' science acumen and their ability to present their findings.

"Resident Research Day reminds us that our residents are not only excellent clinicians," says DCNS head Dr. Rajiv Midha.

"But they're also committed to



the science that will drive clinical advances in the years to come."

"We are exceptionally proud of the clinician-scientists in our residency programs."

The young doctors provide a glimpse into their research—

which is an important part of all residency programs—and they compete for two prestigious awards.

In 2014, the J. Gregory Cairncross Award for Excellence in Clinical Research was won by Dr. Janet Tapper and the Doug W. Zochodne Award for Excellence in Basic Science Research was won by Dr. Rita Nguyen.



TOP: Dr. Rita Nguyen presents her research on cellular inflammatory response in repetitive mild traumatic brain injury at Resident Research Day 2014.

LEFT: Dr. Janet Tapper (left) and Dr. Rita Nguyen (right) receive their Resident Research Day awards from Department Head Dr. Rajiv Midha.

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.

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, Manager, 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.



Dr. Michael Yeung

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 in clinical or academic neurology. The program has trained over 40 neurologists since its inception in 1981; these specialists practice neurology in community and academic institutions throughout the world.

Neurosurgery Residency Program

Program Director: Dr. R. John Hurlbert

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, glioma, skull base, epilepsy, function 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.

From the moment residents enter the program, they are continuously involved in research and education initiatives. Considerable resources are dedicated each year to facilitating this academic activity through faculty participation, existing peer-reviewed grants, project funding from sectional and department sources and 12 months of mandatory clinical or basic science research. The neurosurgery school runs each week for two hours on Monday



Dr. R. John Hurlbert

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 have been the recipients of various awards for their outstanding clinical and academic endeavors. Dr. Albert Isaacs, Dr. Andrew Ryu and Dr. Michael Yang garnered awards for the best neurosurgery posters at the annual Canadian Neurological Sciences Federation meeting in Toronto. Dr. Rita Nguyen was selected by the attending teaching faculty for this year's resident basic science presentation award at the annual Alberta Neurosurgical Society meeting as well as the Doug Zochodne plaque for the best basic science presentation at the 2014 DCNS Research Day.

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.

Physical Medicine and Rehabilitation (PM&R) Residency Program

Program Director: Dr. Stephanie Plamondon

Program Administrator: Selena Smith

Number of positions per year: 2

Accreditation: Royal College of Physicians and Surgeons of Canada

Length of Training: 5 years

The Section of Physiatry provides teaching for undergraduate and post-graduate education.

Within the last academic year, the section supported 10 post-graduate Residents in its Royal College accredited Physical Medicine and Rehabilitation training program. In addition, there were 18 off-service and visiting residents. The section was able to accommodate close to 30 formal electives for medical students, several Meds 440 courses and approximately 10 shadowing students. The demand for Physiatry electives and shadowing opportunities has been continuing to grow over the last few years and is keeping pace with the PM&R staff growth. The Section of Physiatry provides support to the medical school in Course 1 (MSK) and Course 5 (Neuro) teaching for small groups, lectures, and clinical skills.

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 Physical Medicine and Rehabilitation 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



Dr. Stephanie Plamondon

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.

Since our residency training program's inception in 2004, all of our 13 graduating University of Calgary PM&R residents have successfully passed both their Royal College Certification examinations and their EMG (CSCN) examinations (100 per cent pass rate). They have also all successfully started their careers in either tertiary centres, mid-size 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.

The University of Calgary PM&R Residency Training Program underwent successful accreditation this year (February 2015) by the Royal College of Physicians and Surgeons of Canada and was again granted full approval status.

The program also led and supported another successful multidisciplinary education event in May, "Amputee Day", which brought PM&R staff, residents, Allied Health and prosthetists together to create networking opportunities, share knowledge and ultimately try to improve Amputee care in the region.



Physical Medical & Rehabilitation Residency Program member supported and attended Amputee Day in May 2015.



Fellowships in Clinical Neurosciences

Overview

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

DCNS has an average of 30 Fellows each year studying in a variety of specialties.

Individual Fellows work on specific projects targeted to clinical neurosciences problems in a variety of areas including:

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

Within the University of Calgary and Alberta Health Services, the structure of DCNS is uniquely suited to advancing research from the laboratory directly to the patient's bedside. The department has been fortunate to attract Fellows from a wide variety of backgrounds seeking further subspecialty experience. Their presence has enriched the clinical and academic environment for all.

Many of our Fellows have received international awards during their Fellowship training and 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 nearly 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.
- **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.

This year our annual report highlights a number of research initiatives including:

- The success of the ESCAPE Trial, which brought well-deserved attention to the Calgary Stroke Program. The trial, led by **Dr. Michael Hill, Dr. Andrew Demchuk, Dr. Mayank Goyal** and **Dr. Bijoy Menon**, is changing the way the world treats ischemic stroke and its effects will be felt for years to come.
- Neurosurgery resident **Dr. Joey Grochmal** is one of a number of DCNS trainees who has led by example. Instead of completing the customary one-year of research, he's invested extra time away from his residency program—in Dr. Grochmal's case to complete a PhD within the Clinical Investigator Program.
- **Dr. Oury Monchi's** successful recruitment to the Department of Clinical Neurosciences and the Hotchkiss Brain Institute was, in part, because of the strength of our research programs. Dr. Monchi credits the freedom he was given to build his movement disorders research lab here as a factor in his move from Montréal.

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.

In the pages of this annual report we are pleased to provide details of the publication and funding accomplishments in the past year by our Department members.

Grants*

Neurology

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Barber, Philip A.	Acute Quantitative T1 and T2	Department of Clinical Neurosciences	\$50,000
Barber, Philip A.	Cognition and brain ATrophy after Cerebrovascular event in High risk patients	Pfizer	\$400,000
Barber, Philip A.	Canadian Stroke Trials for Optimized Results (CaSTOR)	Canadian Institutes of Health Research	\$1,500,000
Barber, Philip A.	A blood test for Alzheimer's based on fluorescence spectroscopy	The Weston Brain Institute	\$150,000
Barber, Philip A.	Pathophysiology and treatment of stroke recurrence	Canadian Institutes of Health Research	\$574,500
Barber, Philip A.	Recanalization following Endovascular treatment and imaging of PERfusion, Regional InFarction and atrophy to Understand Stroke Evolution (REPERFUSE)	Heart & Stroke Foundation of Canada	\$197,505
Barber, Philip A.	Imaging Biomarker Diagnosis of Cognitive Impairment in Mild Stroke and TIA	Katthy Taylor Vascular Dementia Research Chair	\$37,000
Barber, Philip A.	Vascular Illness and its Impact on Neurodegenerative diseases	Canadian Institutes of Health Research	\$750,000
Barber, Philip A.	Quality Improvement Clinical Research (QuICR): Alberta Stroke Program	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Becker, Werner J.	An open label extension study to asses the long term safety and efficacy of AMG 334	Amgen Canada Inc.	\$62,364
Becker, Werner J.	A phase 2 randomized double-blind placebo-controlled study to evaluate the efficacy and safety of AMG 334 in chronic migraine prevention	Amgen Canada Inc.	\$83,058
Becker, Werner J.	Frovatriptan as a Transitional Therapy in Medication Overuse Headache	University of Calgary	\$80,000
Becker, Werner J.	Evaluation of an aerobic exercise program in migraine management	Alberta Health Services	\$60,000
Burton, Jodie	The Impact of Menstrual History on Multiple Sclerosis	endMS/MS Society of Canada	\$13,500
Burton, Jodie	Studying the Immunological Profile of Neuromyelitis Optica Patients Undergoing Autologous Hematopoietic Stem Cell Transplant	Hotchkiss Brain Institute, University of Calgary	\$20,000
Busche, Kevin	The NEurological diseasE and Depression Study (NEEDS) - addressing the burden, course and impact of depressive disorders in neurological conditions	Alberta Health	\$450,000

* Includes grants where DCNS faculty are PI, co-PI or members of a multi-centre, multi-year funded trial.

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Cooke, Lara J.	Clinical Queries, Prescribing Practices Clinical Queries, Diagnostic Imaging Clinical Queries, Laboratory Data	AMA/Alberta Health	\$1,700,000
Cooke, Lara J.	Simulation in Continuing Medical Education and Professional Development (CME & PD): What will it take to bring simulation to the practicing physician?	OHMES	\$8,928
Cooke, Lara J.	Can Neurology Residents' Empathy be Enhanced?	American Academy of Neurology	\$9,800
Cooke, Lara J.	Completing a quality ITER: Can we influence the demonstrated skills of clinical supervisors?	Academy for Innovation in Medical Education	\$21,875
Costello, Fiona	A 3-year Multi-center Study to Evaluate Optical Coherence Tomography as an Outcome Measure in Patients with Multiple Sclerosis (OCTiMS)	Novartis	\$50,000
Costello, Fiona	Use of optical coherence tomography (OCT) in the study of Parkinson's Disease and other parkinsonian syndromes	Hotchkiss Brain Institute - private donor	\$80,000
Costello, Fiona	Investigating mechanisms of axonal degeneration in multiple sclerosis	National MS Society	\$1,124,000
Costello, Fiona	A Multicenter Collaborative Study on the Clinical Features, Expression Profiling, and Quality of Life in Pediatric Fascioscapulohumeral Muscular Dystrophy (EID 24052)	US FSH-Society and Muscular Dystrophy Canada	\$96,600
Costello, Fiona	A Randomized, Double-Blind, Parallel- Group, Placebo Controlled Study to Assess the Efficacy, Safety, Tolerability, and Pharmacokinetics of BIIB033 in Subjects With First Episode of Acute Optic Neuritis. Protocol No. 215ON201	Biogen Idec.	\$8,000
Coutts, Shelagh B.	Distinguished clinician Scientist Award	Heart & Stroke Foundation of Canada	\$500,000
Coutts, Shelagh B.	Clinical Investigator award	Alberta Heritage Foundation for Medical Research (AHFMR)	\$1,174,250
Coutts, Shelagh B.	CT And MRI in the Triage of TIA and minor Cerebrovascular events to identify High risk patients. (CATCH)	Pfizer Cardiovascular research award	\$200,000
Coutts, Shelagh B.	Diagnosis Of Uncertain-origin Benign Transient neurological symptoms (DOUBT)	Canadian Institutes of Health Research	\$594,855
Coutts, Shelagh B.	Reducing Stroke burden with hospital-ready biomarker test for rapid TIA triage	Genome Canada	\$4,878,969

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Demchuk, Andrew	Precise and Rapid assessment of collaterals using multi-phase CTA in the triage of patients with acute ischemic stroke IA Therapy (PROVE-IT)	Canadian Institutes of Health Research	\$295,000
Demchuk, Andrew	Canadian Stroke Organization for Clinical Research (CaSTOR)	Canadian Institutes of Health Research	\$1,500,000
Demchuk, Andrew	Spot Sign Selection of Intracerebral Hemorrhage to Guide Hemostatic Therapy (SPOTLIGHT): A Randomized Controlled Study	Canadian Institutes of Health Research	\$1,456,206
Demchuk, Andrew	Spousal relationships and neurobehavioural sequelae post-mild stroke	Heart & Stroke Foundation of Canada	\$156,000
Demchuk, Andrew	A randomized controlled trial of early robotic rehabilitation of the upper limb following Stroke	Heart & Stroke Foundation of Canada	\$316,654
Demchuk, Andrew	Cerebral perfusion and blood pressure in intracerebral hemorrhage: a safety study AHFMR Clinical Investigator Award (ICH-ADAPT)	AHFMR	\$1,210,000
Demchuk, Andrew	The Frontier Trial – Field Randomization of NA-A Treatment in Early Responders	Brain Canada	\$6,578,920
Demchuk, Andrew	ESCAPE Trial	Coviden	\$2,900,000
Demchuk, Andrew	Predicting hEmatoma growth and outcome in Intracerebral hemorrhage using contrast bolus CT (PREDICT) study	Novo Nordisk Canada	\$62,000
Demchuk, Andrew	ALIAS Trial	National Institutes of Health Research (NIH US)	\$280,000
Demchuk, Andrew	Identifying New approaches to optimize Thrombus characterization for predicting Early Recanalization and Reperfusion with iv tPA using Serial CT angiography (INTERSeCT)	Canadian Institutes of Health Research	\$261,447
Demchuk, Andrew	MRI of Reperfusion following Endovascular treatment using Perfusion/Permeability to Evaluate Regional infarction to Understand Stroke Evolution (REPERFUSE)	Heart & Stroke Foundation of Canada	\$104,000
Demchuk, Andrew	Rehabilitation, Stroke Deficits And Robotic Technology (RESTART)	Canadian Institutes of Health Research	\$843,555
Demchuk, Andrew	Efficient/Effective Delivery & Follow-up of Cardiovascular Implantable Electrical Devices in Alberta: Performance Evaluation & Rhythm Follow-up Optimization with Remote Monitoring (PERFORM) Collaborative Project	Alberta Innovates - Health Solutions (AIHS)	\$749,875

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Demchuk, Andrew	Quality Improvement Clinical Research (QuICR) Stroke Program	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Feasby, Thomas	International Guillain-Barre Syndrome Outcome Study (IGOS)	GBS/CIDP Foundation, Grifols Pharmaceuticals, CSL/Behring	\$42,356
Federico, Paolo	Predicting seizure onset	Canadian Institutes of Health Research	\$609,245
Federico, Paolo	Superior seizure focus localization: implications for surgical outcome	Canadian Institutes of Health Research	\$830,720
Federico, Paolo	Resting-state fMRI (rs-fMRI) as a prognostic tool in surgical neuro-oncology	Hotchkiss Brain Institute	\$20,000
Federico, Paolo	Voxel-based relaxometry in focal epilepsy	Epilepsy Canada	\$100,000
Federico, Paolo	Neurovascular changes preceeding seizures	Hotchkiss Brain Institute	\$20,000
Federico, Paolo	Neurovascular changes associated with the pre-ictal state	University of Calgary, Fac of Medicine	\$20,000
Fletcher, William A.	Study of the Vestibulo-Ocular Reflex in Normal Subjects and Patients with Vestibular Dysfunction		\$45,000
Fletcher, William A.	Idiopathic Intracranial Hypertension Treatment Trial (IIHTT) and Longitudinal IIHTT	National Institutes of Health Research (NIH US)	\$27,300
Fletcher, William A.	Visual rehabilitation of patients with homonymous hemianopia – a pilot study	Gimbel Eye Foundation	\$26,000
Hill, Michael Douglas	(ESCAPE) Endovascular treatment for Small Core and Anterior circulation Proximal occlusion with Emphasis on minimizing CT to recanalization times	Canadian Institutes of Health Research	\$2,700,000
Hill, Michael Douglas	PeriOperative ISchemic Evaluation-2 (POISE-2) Trial	Canadian Institutes of Health Research	\$3,684,006
Hill, Michael Douglas	DOUBT - Diagnosis Of Uncertain-origin Benign Transient neurological symptoms	Canadian Institutes of Health Research	\$594,855
Hill, Michael Douglas	TEMPO-1. Thrombolysis for Minor Ischemic Stroke With Proven Acute Symptomatic Occlusion Using Tnk-tPA	Heart & Stroke Foundation of Canada	\$150,000
Hill, Michael Douglas	Strategic Team in Applied Injury Research	Canadian Institutes of Health Research	\$2,000,000
Hill, Michael Douglas	Canadian Stroke Trials for Optimized Results (CaSTOR) grant	Canadian Institutes of Health Research	\$1,500,000
Hill, Michael Douglas	The Frontier Trial - Field Randomization of NA-1 Treatment In Early Responders Brain Canada	Health Services Research and Innovation	\$6,578,920

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Hill, Michael Douglas	NeuroVISION Study: Detection and Neurological Impact of Cerebrovascular Events In Noncardiac Surgery Patients: A Cohort Evaluation	Canadian Institutes of Health Research	\$649,624
Hill, Michael Douglas	Quality Improvement Clinical Research (QuICR) Stroke Program	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Hill, Michael Douglas	Precise and Rapid assessment of collaterals using multi-phase CTA in the triage of patients with acute ischemic stroke for IV or IA Therapy (PRoVe-IT)	Canadian Institutes of Health Research	\$272,271
Hill, Michael Douglas	Rehabilitation, Stroke Deficits and Robotic Technology (RESTART)	Canadian Institutes of Health Research	\$843,556
Hill, Michael Douglas	ESCAPE trial (Endovascular for Small Core and Anterior circulation Proximal occlusion with Emphasis on minimizing CT to recanalization times)	Hotchkiss Brain Institute	\$500,000
Hill, Michael Douglas	Development of an inpatient stroke rehabilitation clinic trials network Canadian Stroke Network and Heart & Stroke Foundation Centre for Stroke Recovery	Heart & Stroke Foundation of Canada	\$320,000
Hill, Michael Douglas	Early Robotic Rehab Upper Limb After Stroke	Heart & Stroke Foundation of Canada	\$316,654
Jetté, Nathalie	Building a Foundation for a Depression eHub for Neurological Patients	Hotchkiss Brain Institute & Pfizer Canada	\$49,950
Jetté, Nathalie	Implementation and evaluation of a multi-component online resource for caregivers of persons with dementia	Canadian Institutes of Health Research (CIHR) - Knowledge-to-Action Operating Grant	\$200,000
Jetté, Nathalie	Improving care for elderly Parkinson's and dementia patients with comorbid mood disorders. PIs: Dr. J. Holroyd-Leduc and Z. Goodarzi Co-investigator: N. Jetté	University of Calgary Department of Medicine	\$10,000
Jetté, Nathalie	Novel statistical methods for analyzing skewed data: Improving the accuracy of health data analysis to inform health policy and resource allocation	MSI Foundation	\$97,500
Jetté, Nathalie	Ambulatory case sensitive conditions identified in hospital discharge data: Which admissions are deemed avoidable?	Cumming School of Medicine and U of C Medical group	\$31,000
Jetté, Nathalie	The appropriateness of lumbar spine fusion	Cumming School of Medicine and University of Calgary Medical Group	\$50,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Jetté, Nathalie	Improving care for adults with Parkinson's disease and dementia complicated by comorbid depression and anxiety	Alberta Innovates Health Solutions – Knowledge to Action Grant	\$24,936
Jetté, Nathalie	Supporting family caregivers of seniors: Improving care and caregiver outcomes	Canadian Institutes of Health Research	\$23,490
Jetté, Nathalie	Robust measures of domain importance for response shift detection in longitudinal health-related quality of life data	University of Calgary Seed Grant	\$14,864
Jetté, Nathalie	A European pilot network of reference centres in refractory epilepsy and epilepsy surgery	European Commission – Executive Agency for Health and Consumers	\$1,429,420
Jetté, Nathalie	The NEurological diseasE and Depression Study (NEEDS)	Alberta Health Services, U of C Faculty of Medicine, Hotchkiss Brain Institute	\$480,000
Jetté, Nathalie	Neuroscience Health Services Research	Canada Research Chair Tier 2	\$500,000
Jetté, Nathalie	Development of an appropriateness and necessity rating tool to identify patients with potentially resectable focal epilepsy	Alberta Innovates - Health Solutions (AIHS)	\$952,000
Jetté, Nathalie	NeuroResearch Clinic Initiative	Hotchkiss Brain Institute and Department of Clinical Neurosciences	\$280,000
Jetté, Nathalie	Canadian guidelines on pharmacotherapy for oppositional behavior, conduct problems and aggression in children and adolescents with disruptive behavior disorders: Creation of a patient decision aids to reduce decisional conflict and encourage active decision making	Canadian Institutes of Health Research	\$11,830
Koch, Marcus	Analyses of functional outcomes to determine optimal cut-scores which represent disability progression in MS, as well as to validate thresholds which represent clinically meaningful change in the PROMISE randomized controlled trial	TEVA Pharmaceuticals	\$9,996
Koch, Marcus	Discretionary funds for MS research	Univeristy of Calgary	\$200,000
Koch, Marcus	Medicines for remyelination in MS: the next frontier	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Kraft, Scott	A Phase 3, 12-week, Double-Blind, Placebo-Controlled, Randomized, Multicenter Study to Evaluate the Efficacy of Oral Istradefylline 20 and 40 mg/day as Treatment for Subjects with Moderate to Severe Parkinson's Disease	Kyowa Kirin	\$63,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Menon, Bijoy	GENEDCSS	National Institutes of Health (NIH)	\$100,000
Menon, Bijoy	Endovascular treatment for Small Core and Anterior circulation Proximal occlusion with Emphasis on minimizing CT to recanalization times (ESCAPE)	Covidien	\$2,700,000
Menon, Bijoy	Comparing collaterals across different vascular beds	HBI/DCNS	\$20,000
Menon, Bijoy	MRI of Reperfusion following Endovascular treatment using Perfusion/ Permeability to Evaluate Regional infarction to Understand Stroke Evolution (REPERFUSE)	Heart & Stroke Foundation of Canada	\$104,000
Menon, Bijoy	Managing Cardiovascular Contractile Abnormalities with a Novel Inhibitor of Zipper-interacting Protein Kinase	Alberta Innovates - Health Solutions (AIHS)	\$200,000
Menon, Bijoy	Precise and Rapid assessment of collaterals using multi-phase CTA in the triage of patients with acute ischemic stroke for IA Therapy (PRoVe-IT)	Canadian Institutes of Health Research	\$295,000
Menon, Bijoy	Identifying New approaches to optimize Thrombus characterization for predicting Early Recanalization and Reperfusion with iv tPA and other treatments using Serial CT angiography (INTERRSeCT)	Canadian Institutes of Health Research	\$361,447
Menon, Bijoy	QulCR: Quality Improvement, Clinical Research: Acute Stroke - The First 12 Hours	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Menon, Bijoy	Automated triage system for patients with stroke	University of Calgary Bridge Funding	\$40,000
Metz, Luanne	Implementation of the Canadian MS Monitoring System in Calgary	Alberta Health	\$100,000
Metz, Luanne	The Alberta MS Initiative (TAMSI): Phase I Multiple Sclerosis Database to Study Chronic Cerebrospinal Venous Insufficiency (CCSVI)	Alberta Health	\$1,000,000
Metz, Luanne	Safety and tolerability of quetiapine in multiple sclerosis	Donor	\$12,000
Metz, Luanne	Medicines for Remyelination in Multiple Sclerosis: The Next Frontier	Alberta Innovates - Health Solutions (AIHS)	\$5,000,000
Metz, Luanne	Phase III double-blind, randomized, placebo-controlled trial of minocycline in clinically isolated syndrome (CIS)	Multiple Sclerosis Society of Canada	\$4,050,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Pringsheim, Tamara	Knowledge Translation of the Canadian Guidelines on the Treatment of Tourette Syndrome	Calgary Health Trust	\$10,000
Pringsheim, Tamara	Canadian Guidelines on Pharmacotherapy for Oppositional Behaviour, Conduct Problems, and Aggression in Children and Adolescents with Disruptive Behaviour Disorders: Creation of a Patient Decision Aid to Reduce Decisional Conflict and Encourage Active Decision Making	Canadian Institutes of Health Research	\$11,830
Pringsheim, Tamara	Canadian Clinical Practice Guidelines for the Treatment of Schizophrenia and Other Psychotic Disorders	Hotchkiss Brain Institute/ Mathison Centre	\$40,000
Pringsheim, Tamara	TICS: Transcranial magnetic stimulation for children with Tourette Syndrome	Hotchkiss Brain Institute/ Mathison Centre	\$20,000
Pringsheim, Tamara	Assessment and treatment of aggression in children with disruptive behaviour disorders: Development of an educational curriculum for residency education	Sick Kids Foundation & Royal Bank of Canada	\$114,000
Pringsheim, Tamara	Knowledge translation and dissemination of an antipsychotic safety monitoring guideline for children	Canadian Institutes of Health Research	\$75,227
Pringsheim, Tamara	Assessment and Treatment of Oppositional Behaviour, Conduct Problems and Aggression in Children with Attention Deficit Hyperactivity Disorder, Oppositional Defiant Disorder and Conduct Disorder: Bringing Knowledge to Action Among Family Physicians and Pediatricians	Shire Canada	\$100,000
Pringsheim, Tamara	Rising prescriptions for quetiapine for depression: Understanding influences on prescribing behaviour and identifying the knowledge to action gap	Alberta Mental Health Strategic Clinical Network	\$15,000
Smith, Eric E.	Rivaroxaban for the Prevention of Major Cardiovascular Events in Coronary or Peripheral Artery Disease (COMPASS) MIND substudy MRI services contract	McMaster University	\$102,857
Smith, Eric E.	Cerebral Small Vessel Disease and Beta-Amyloid Deposition in Subjects with Mildly Impaired Cognition	Alberta Innovates - Health Solutions (AIHS)	\$60,000
Smith, Eric E.	Cognition and Vascular Function in Cerebral Amyloid Angiopathy	Heart & Stroke Foundation of Canada	\$38,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Smith, Eric E.	Neuropsychological and Cerebral Blood Flow Profile of Cerebral Amyloid Angiopathy	Alzheimer Society of Canada	\$18,924
Smith, Eric E.	MR Quantitative Iron Imaging in Alzheimer's Disease and Dementia	Alberta Innovates - Health Solutions (AIHS)	\$15,000
Smith, Eric E.	PURE-MIND: A Population-based Study of Covert Cerebrovascular Disease and Its Contribution to Age-Related Cognitive Decline	Canadian Institutes of Health Research	\$240,291
Smith, Eric E.	Cardiovascular and Cognitive Dysfunction (CVCD) Alliance	Canadian Partnership Against Cancer	\$192,290
Smith, Eric E.	Relationship Between "Covert" Brain Ischemia and Cognitive and Physical Decline in Middle-Aged Canadians	Heart & Stroke Foundation of Canada	\$46,327
Smith, Eric E.	Vascular Illness and its Impact on Neurodegenerative Diseases	Canadian Institutes of Health Research	\$133,600
Smith, Eric E.	NeuroVISION Study: Detection And Neurological Impact Of Cerebrovascular Events In Noncardiac Surgery Patients: A Cohort Evaluation Study	Canadian Institutes of Health Research	\$22,500
Smith, Eric E.	Realising the potential of cohort studies to determine the vascular contribution to neurodegeneration	Canadian Institutes of Health Research	\$33,669
Stys, Peter	The axo-myelinic synapse	Canadian Institutes of Health Research	\$845,320
Stys, Peter	A blood test for Alzheimer's based on fluorescence spectroscopy	Weston Brain Institute	\$169,100
Stys, Peter	Role of NMDA receptors in AD pathology - a complex interaction with TAU and cellular prion protein	Alberta Prion Research Institute	\$200,000
Stys, Peter	Pathobiology of MS: complex interplay between degeneration and inflammation	Multiple Sclerosis Scientific Research Foundation	\$3,900,000
Stys, Peter	CRC in axo-glial biology	Canadian Research Chair (CIHR)	\$1,643,600
Stys, Peter	AIHS CRIO - MS Meds	Alberta Innovates - Health Solutions (AIHS)	\$210,000
Wiebe, Samuel	Increasing usability of administrative healthcare data through a web based tool for systematic exploration of medical coding ontologies	Alberta Innovates - Health Solutions (AIHS)	\$9,000
Wiebe, Samuel	The appropriateness of Lumbar Fusion	Cumming School of Medical Enhance Bridge Funding	\$12,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Wiebe, Samuel	The non-Invasive evaluation of Intracranial Hypertension in Severe Traumatic Brain Injury: A Pilot Study	University Research Grant - University of Calgary	\$6,000
Wiebe, Samuel	Novel statistical methods for analyzing skewed data: Improving the accuracy of health data analysis to inform health policy and resource allocation	MSI Foundation	\$32,000
Wiebe, Samuel	Efficacy and Safety of Brivaracetam in patients with partial onset Seizures	UCB	\$3,000
Wiebe, Samuel	Follow up study of Long Term Safety and Efficacy of Brivaracetam used as adjunctive treatment in partial onset seizures	UCB	\$3,000
Wiebe, Samuel	Long-term use and safety of lacosamide monotherapy as adjunctive therapy in patients with partial-onset seizures	UCB	\$2,800
Wiebe, Samuel	Efficacy and safety of conversion to lacosamide 400mg/day monotherapy in subjects with partial-onset seizures	UCB	\$3,000
Wiebe, Samuel	Hopewell Professorship for Clinical Neurosciences Research	Hopewell Professorship	\$150,000
Wiebe, Samuel	Understanding the epidemiology of neurological conditions	Public Health Agency of Canada	\$50,000
Wiebe, Samuel	Prospective assessment electroencephalography in comatose neurocritical care patients	Hotchkiss Brain Institute Clinical Research Unit	\$3,000
Wiebe, Samuel	Efficacy and safety of E2007 (Perampanel) in refractory partial seizures	Eisai	\$5,500
Wiebe, Samuel	Efficacy and safety of E2007 (Perampanel) in refractory partial seizures (E2007-G000-304)	Eisai	\$3,200
Wiebe, Samuel	Health Related Quality of Life in Children with New-Onset Epilepsy: A Long-term Follow-up	Canadian Institutes of Health Research	\$45,000
Wiebe, Samuel	Neurological registry best practice guidelines and implementation toolkit	Public Health Agency of Canada	\$50,000
Wiebe, Samuel	Knowledge Translation Supplementation Improving appropriate care for those with Epilepsy - Knowledge translation of the CASES clinical decisions support tool	Canadian Institutes of Health Research	\$22,000
Wiebe, Samuel	The Neurological disease and Depression Study (NEEDS) - addressing the burden course and impact of depressive disorders in neurological conditions	Alberta Health Services and Hotchkiss Brain Institute	\$80,000

Grants

Neurology (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Wiebe, Samuel	Katherine Ewert	Canadian Institutes of Health Research (CIHR)/ Queen Elizabeth II (QEII) Graduate (Master's) Scholarships	\$10,800
Wiebe, Samuel	Jordan Engbers	Alberta Innovates Health Solutions Postdoctoral Fellowship	\$70,000
Wiebe, Samuel	Colin Josephson	Canadian Institutes for Health Research Fellowship	\$165,000
Wiebe, Samuel	Colin Josephson	Susan S Spencer Clinical Research Training Fellowship Award (American Brain Foundation, American Epilepsy Society, Epilepsy Foundation)	\$130,000
Wiebe, Samuel	Colin Josephson	Alberta Innovates Health Solutions Clinical Fellowship	\$70,000
Wiebe, Samuel	Daniel Yavin	Vanier Canada Graduate Scholarship- CIHR	\$50,000
Wiebe, Samuel	Daniel Yavin	Alberta Innovates Health Solutions Clinical Fellowship	\$70,000
Wiebe, Samuel	Khara Sauro	Alberta Innovates Health Solutions, PhD Studentship	\$32,000

Grants*

Neurosurgery

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Casha, Steve	Minocycline in Acute Spinal Cord Injury - a Canadian multicenter study (MASC)	Alberta Paraplegic Foundation	\$140,256
Casha, Steve	Appropriateness of Surgical Fusion of the Lumbar Spine	Alberta Spine Foundation	\$20,000
Casha, Steve	The Graded and Redefined Assessment of Strength, Sensibility and Prehension (GRASSP): Responsiveness Testing Prior to Utilization in Clinical Trials, Minimally Clinical Important Difference and Meaningfulness of Change of the GRASSP	Albeta Paraplegic Foundation	\$50,000
Casha, Steve	MASC - Minocycline in acute spinal cord injury	Rick Hansen Institute	\$1,300,000
Gallagher, Clare	Randomised Evaluation of Surgery with Craniectomy for patients Undergoing Evacuation of Acute Subdural Haematoma (RESCUE-ASDH)	National Institute of Health Research	\$2,200,000
Gallagher, Clare	Cerebral Energy Metabolism in Injured and Uninjured Brain	Medical Research Council	\$800,000
Gallagher, Clare	Cerebral metabolism in Severe Traumatic Brain Injury	HBI Rebecca Hotchkiss International Scholar Exchange	\$4,000
Hamilton, Mark	Adult Hydrocephalus Clinical Research Network Core Data Project		\$350,000
Hamilton, Mark	Adult Hydrocephalus Clinical Research Network Core Data Project		\$200,000
Hurlbert, R. John	Surgery vs. Conservative Mangement of Type II Odontoid Fractures	AANS/CNS Apfelbaum Award	\$45,000
Hurlbert, R. John	Novartis SCI Trial	Brain Canada, Rick Hansen Institute	\$30,000
Hurlbert, R. John	SCI Registry		\$60,000
Hurlbert, R. John	VTI Implant		\$20,000
Hurlbert, R. John	Odontoid		\$40,000
Hurlbert, R. John	Stem Cell Phase II		\$160,000
Hurlbert, R. John	MASC		\$90,000
Hurlbert, R. John	Riluzole		\$35,000
Jacobs, W. Bradley	Alberta Paralysis Foundation	Alberta Spinal Cord Injury Registry Development Project. Co-PI with Chester Ho	\$10,000

* Includes grants where DCNS faculty are PI, co-PI or members of a multi-centre, multi-year funded trial.

Grants

Neurosurgery (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Jacobs, W. Bradley	Alberta Spinal Cord Injury Registry Development Project	Alberta Paralysis Foundation	\$10,000
Jacobs, W. Bradley	Mean Arterial Pressure in Spinal Cord Injury (MAPS): Determination of non-inferiority of a mean arterial pressure of 65 mmHg compared to a mean arterial pressure of 85 mmHg in acute human traumatic spinal cord injury.	AANS/CNS Section of Spine and Peripheral Nerves	\$50,000
Kelly, John	Resting-state fMRI (rs-fMRI) as a Prognostic Tool in Surgical Neuro-oncology		\$20,000
Kelly, John	Combinatorial treatment of glioblastoma initiating cells with microglial cytokines and STAT3 inhibition	Brain Tumour Foundation of Canada	\$25,000
Kelly, John	Activating macrophages and microglia to suppress brain tumor initiating cells	Alberta Innovates - Health Solutions (AIHS)	\$750,000
Kiss, Zelma	Database for movement disorder surgery		\$10,000
Kiss, Zelma	Role of cholinergic modulation in the mechanisms of DBS for Parkinson's disease		\$40,000
Kiss, Zelma	Electrical stimulation for CP dystonia: Mechanisms of action		\$30,000
Kiss, Zelma	Deep brain stimulation for treatment resistant depressive disorders	Alberta Innovates - Health Solutions (AIHS)	\$108,001
Kiss, Zelma	Smart Neural Prostheses to Restore Motor and Sensory Function	Alberta Innovates - Health Solutions (AIHS)	\$106,000
Midha, Rajiv	Peripheral nerve regeneration lab operating support		\$100,000
Midha, Rajiv	HBI and Integra LifeSciences Centre of Excellence in Nerve Regeneration at University of Calgary. Stem cell therapies for nerve repair and regeneration.	HBI and Integra for LifeSciences Centre of Excellence in Nerve Regeneration	\$25,000
Midha, Rajiv	Bioprocess production of skin derived precursor (SKP) Schwann cell as autologous cell therapy for nerve and spinal cord repair.	Alberta Innovates - Health Solutions (AIHS)	\$250,000
Midha, Rajiv	Eyes High Fellowship Program Award.	University of Calgary	\$50,000

Grants

Neurosurgery (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Midha, Rajiv	Schwann cell therapy to reduce annual attrition and misdirection in the injured nerve.	David Kline Research Award	\$15,000
Midha, Rajiv	Peripheral nerve fellowship at the University of Calgary.	Integra LifeScience Foundation	\$25,000
Midha, Rajiv	Skin-derived Schwann cell therapy for remyelination, innate immunomodulation and axonal support in multiple sclerosis. Midha R, Ousman S.	Alberta EndMS Regional Research and Training Centre	\$30,000
Mitha, Alim	Mesenchymal Stem Cell-Seeded Endovascular Coils to Prevent Recurrence after Treatment of Brain Aneurysms	Stryker Corporation	\$110,000
Mitha, Alim	Intravenous Mesenchymal Stem Cell Therapy on Aneurysm Formation in a Rabbit Model	Brain Aneurysm Foundation	\$10,000
Mitha, Alim	Tissue Engineering to Treat Intracranial Saccular Aneurysms		\$400,000
Mitha, Alim	Changes in Intra-Aneurysmal Pressure after Flow Diversion	Hotchkiss Brain Institute	\$20,000
Mitha, Alim	Drug-Eluting Bioabsorbable Stents for the Treatment of Cerebral Vasospasm Following Subarachnoid Hemorrhage	Brain Aneurysm Foundation	\$10,000
Mitha, Alim	A Bioabsorbable Self-Expanding Stent to Treat Intracranial Aneurysms	Zymetrix	\$42,000
Sutherland, Garnette	Developing diagnostic proteomic signatures for molecular characterisation of meningioma.	Advancing iMRI-Calgary Health Trust	\$500,000
Sutherland, Garnette	Connectivity		\$200,000
Sutherland, Garnette	A Novel Neurosurgery-specific Haptic Hand-controller for Robot assisted Surgical Systems	CHRP-NSERC Partnered	\$540,000
Sutherland, Garnette	Development of an MR visible Biomarker for Traumatic Brain Injury	nanoBridge, Alberta	\$75,000
Sutherland, Garnette	iMiND an international database program for intra-operative MRI	Advancing iMRI-Calgary Health Trust	\$1,500,000
Sutherland, Garnette	SmartForceps for Quantification of Surgical Dissection and Enhanced Training	Medical Robotics-Calgary Health Trust	\$100,000

Grants

Neurosurgery (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Wong, John	ACORN (Alberta Comprehensive Outcomes Research in Neurosciences) database		\$114,000
Wong, John	NEWTON: Phase 1/2a Multicenter, Controlled, Randomized, Open-Label, Dose Escalation, Safety, Tolerability, And Pharmacokinetic Study Comparing Eg-1962 And Nimodipine In Patients With Aneurysmal Subarachnoid Hemorrhage		\$12,000

Grants*

Physical Medicine & Rehabilitation

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Benson, Brian	BRAIN Study: Biomarkers, Robotics and Innovative Imaging in Acute Sport Concussion	Hotchkiss Brain Institute	\$100,000
Benson, Brian	Diagnostic Markers in Sport Concussion: A Metabolomic Approach	Hotchkiss Brain Institute/ Department of Clinical Neurosciences Pilot Research Fund Program (PFUN) Award	\$20,000
Benson, Brian	Sport Concussion Clinical Research, WinSport Concussion Clinical Research Program	Philanthropic Donation	\$18,800
Churchill, Katie	Comprehensive Driving Evaluation in a Rural Alberta Community: A descriptive study		\$1,000
Debert, Chantel	Safe to Play	Canadian Institute of Health Research	\$1,500,000
Debert, Chantel	UCAN project	Hotchkiss Brain Institute	\$100,000
Debert, Chantel	A Metabolomic Approach to acute Sport Concussion	Hotchkiss Brain Institute/ Division of Clinical Neurosciences	\$20,000
Debert, Chantel	BRAIN Study: Biomarkers, Robotics and Innovative Imaging in Acute Sport Concussion	Hotchkiss Brain Institute	\$100,000
Dukelow, Sean Peter	The Look-Up-Line: Quiet Eye and Head Orientation of Elite Ice Hockey Players During On-Ice Body Checking Drills		\$40,000
Dukelow, Sean Peter	Enhancement of developmental motor plasticity in perinatal stroke with TDCS	Heart & Stroke Foundation of Canada	\$270,000
Dukelow, Sean Peter	Limb Proprioception in Children with Perinatal Stroke Induced Cerebral Palsy	Cerebral Palsy International Research Foundation	\$100,000
Dukelow, Sean Peter	Safe to Play	Canadian Institutes of Health Research	\$1,500,000
Dukelow, Sean Peter	A Randomized Controlled Trial of Early Robotic Rehabilitation of the Upper Limb following Stroke	Heart & Stroke Foundation of Canada	\$316,654
Dukelow, Sean Peter	Development of an inpatient stroke rehabilitation clinical trials network	Canadian Stroke Recovery Network	\$340,000
Dukelow, Sean Peter	Efficacy of Virtual Reality Exercises using Wii gaming technology in Stroke Rehabilitation: A multi centre randomized clinical trial (EVREST Multicentre)	Heart & Stroke Foundation of Canada	\$162,884

* Includes grants where DCNS faculty are PI, co-PI or members of a multi-centre, multi-year funded trial.

Grants

Physical Medicine & Rehabilitation (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Dukelow, Sean Peter	Rehabilitation, Stroke Deficits and RoboTics (RESTART II)	Canadian Institutes of Health Research	\$843,556
Dukelow, Sean Peter	Evaluating the Economic Impact of Quality of Care of the Smart-e-Pants Innovation for Pressure Ulcer Prevention	Alberta Innovates - Health Solutions (AIHS)	\$750,000
Dukelow, Sean Peter	Imaging the sensory network in children with perinatal stroke and cerebral palsy	Hotchkiss Brain Institute - Robertson Fund	\$30,000
Edwards, Brent	Multiscale modeling of the skeletal system: whole-body movement to cellular deformation	National Science and Engineering Research Council (NSERC)	\$23,000
Edwards, Brent	Biomechanical measures of the muscle-bone unit in humans	University Research Grants Committee	\$15,000
Edwards, Brent	Prevention of bone loss after acute SCI by zoledronic acid: durability, effect on bone strength, and use of biomarkers to guide therapy	Department of Defense, SC130125	\$671,560
Gabriel, Vincent	Autologous Dermal Stem Cell Transplantation To Improve Function of Split-Thickness Skin Grafts	Alberta Innovates Health Solutions Collaborative Research and Innovation Opportunities	\$375,000
Ho, Chester Ho Kai	A Prospective Case Series Evaluating the Safety of the KLOX Biophotonic System in Stage II and III Pressure Ulcers	KLOX Technologies Inc.	\$54,457
Ho, Chester Ho Kai	Multi-Modal SCI Patient Education Across the Care Continuum and Lifespan	Craig H. Neilsen Foundation	\$49,390
Ho, Chester Ho Kai	W21C: Interdisciplinary Research and Innovation for Health System Quality and Safety. Project Lead for Project A: Efficacy of a pressure-sensing mattress system for preventing pressure ulcerations in vulnerable patient populations: A randomized controlled trial	Alberta Innovates - Health Solutions (AIHS)	\$4,679,602
Ho, Chester Ho Kai	Neurorehabilitation Program, UCAN Initiative	Hotchkiss Brain Institute	\$114,970
Ho, Chester Ho Kai	Building the Rick Hansen Alberta Spinal Cord Injury Registry	Brain Canada	\$899,934
Ho, Chester Ho Kai	Calgary Spinal Cord Injury Facilitator	Alberta Paraplegic Foundation	\$195,000
Ho, Chester Ho Kai	Spinal cord injury research support fund	Alberta Paraplegic Foundation	\$107,850

Grants*

Translational Neuroscience

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Monchi, Oury	Canadian Research Chair Tier 1 in non-motor deficits in Parkinson's disease	Canada Research Chair	\$1,400,000
Monchi, Oury	Cognitive deficits in PD investigated with dopaminergic and cholinergic radioligands	Canadian Institutes of Health Research	\$574,865
Monchi, Oury	Exploring cortico-striatal connectivity across different domains of cognition combining TMS and fMRI	NSERC	\$180,000
Monchi, Oury	QUO2 MRI : a new window on mitochondrial dysfunction in Alzheimer's disease	2015 Consortium québécois sur la découverte du médicament (CQDM)	\$1,500,000
Monchi, Oury	Sleep and Mild Cognitive Impairment	Canadian Institutes of Health Research	\$847,325
Monchi, Oury	Understanding memory changes and brain plasticity in mild cognitive impairment	Canadian Institutes of Health Research	\$565,000
Hu, Bin	AmbuloSono: a sensorimotor contingent musical walking program for people living with Parkinson's disease	Alberta Innovates - Health Solutions (AIHS)	\$250,000
Hulliger, Manuel	Neuro-locomotor rehabilitation after large-fibre somatosensory loss	Canadian Institutes of Health Research	\$706,730
Nguyen, Minh Dang	Role of the cytoskeleton		\$350,000
Nguyen, Minh Dang	Structural and signaling roles of the cytoskeleton in neuronal survival	Canadian Institutes of Health Research	\$700,000
Nguyen, Minh Dang	Surviving the break-up in DNA	Alberta Innovates Health Solutions (AIHS)	\$80,000
Nguyen, Minh Dang	Surviving the break-up in DNA damage response with a novel partner: TPX2	Canadian Institutes of Health Research	\$270,000
Ousman, Shalina S.	Endogenous protective mechanisms in multiple sclerosis	Hotchkiss Brain Institute	\$350,000
Ousman, Shalina S.	Function of alphaB-crystallin in multiple sclerosis	Alberta Innovates - Health Solutions (AIHS)	\$35,000
Ousman, Shalina S.	Function of alphaB-crystallin in multiple sclerosis	Alberta Innovates - Health Solutions (AIHS)	\$120,000
Ousman, Shalina S.	Investigating the role of Cystatin C in multiple sclerosis	Canadian Institutes of Health Research	\$910,001
Ousman, Shalina S.	Investigating the role of Cystatin C in multiple sclerosis	Multiple Sclerosis Society of Canada	\$86,197

* Includes grants where DCNS faculty are PI, co-PI or members of a multi-centre, multi-year funded trial.

Grants

Translational Neuroscience (cont'd)

RECIPIENT	GRANT	FUNDING SOURCE	AMOUNT
Ousman, Shalina S.	Mechanisms underlying regeneration of the injured peripheral nervous system	Alberta Innovates - Health Solutions (AIHS)	\$87,937
Yong, V. Wee	A phase III double-blind, randomized, placebo-controlled trial of minocycline in clinically isolated syndromes (CIS)	Multiple Sclerosis Society of Canada Foundation Grant	\$4,000,000
Yong, V. Wee	Activating microglia and macrophages to suppress brain tumor-initiating cells	Alberta Innovates - Health Solutions (AIHS)	\$750,000
Yong, V. Wee	Chondroitin sulfate proteoglycans (CSPGs) as inhibitors of remyelination in MS	Multiple Sclerosis Society of Canada	\$400,000
Yong, V. Wee	Defining EMMPRIN as a key regulator of neuroinflammation and neural injury in multiple sclerosis	Canadian Institutes of Health Research	\$920,750
Yong, V. Wee	Medicines for Remyelination in Multiple Sclerosis: The Next Frontier	Alberta Innovates - Health Solutions (AIHS)	\$1,000,000
Yong, V. Wee	N-acetylglucosamine analogs that promote remyelination and reduce detrimental inflammation: Novel therapeutics for multiple sclerosis	Alberta/Pfizer Translational Research Fund Opportunity	\$200,000

Publications*

Neurology

Publications for the period July 1, 2014 to June 30, 2015

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Aghakhani Y, Beers CA, Pittman DJ, Gaxiola-Valdez I, Goodyear BG, **Federico P**. Co-localization between the BOLD response and epileptiform discharges recorded by simultaneous intracranial EEG-fMRI at 3 T. *NeuroImage: Clinical*. 2015 Mar 01;7:755-763.

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Almekhlafi MA, Hockley A, Desai JA, Nambiar V, Mishra S, Volny O, Eesa M, **Demchuk AM**, **Menon BK**, **Goyal M**. Overcoming the evening/weekend effects on time delays and outcomes of endovascular stroke therapy: the Calgary Stroke Program experience. *J Neurointerv Surg*. 2014 Dec 03;6(10):729-32.

Ansari MK, Yong HY, **Metz L**, Yong VW, Zhang Y. Changes in tissue directionality reflect differences in myelin content after demyelination in mice spinal cords. *J Struct Biol*. 2014 Nov 03;188(2):116-22.

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Neurology (cont'd)

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Neurology (cont'd)

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NEUROLOGY



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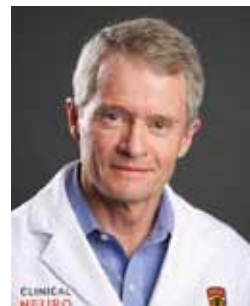
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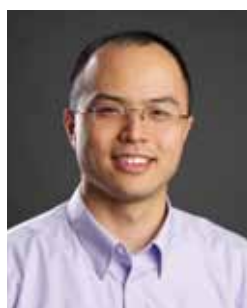
Chester Ho



Ken Lam



Daniel LeBlond



Gentson Leung



Rodney Li Pi Shan

PHYSICAL MEDICINE & REHABILITATION



Christine McGovern



Dan McGowan



Stephen McNeil



Stephanie Plamondon



Jordan Raugust



Gillian Simonett



Vishal Tuli



Noorshina Virani

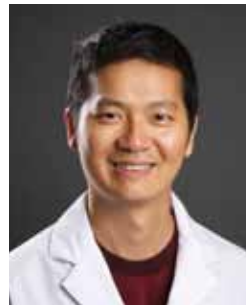
TRANSLATIONAL NEUROSCIENCE



Bin Hu



Oury Monchi



Minh Dang Nguyen



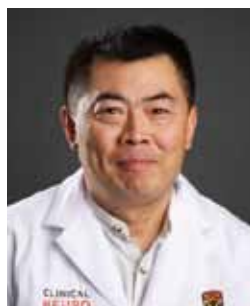
Shalina Ousman



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V. Wee Yong



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