Reports: Research Institutes

POPULATION HEALTH RESEARCH INSTITUTE

PHRI: Influencing the world's health

The Population Health Research Institute (PHRI) is one of Canada's premiere global health research institutes and a world leader in large clinical trials and population studies. Originally formed with a focus on cardiovascular disease and diabetes, PHRI's work has broadened over the past two decades to include population genomics, perioperative medicine and CV surgery, arrhythmia and thrombosis, stroke, heart failure, renal disease, obesity, childhood risk factors, and more.

Dr. Salim Yusuf and research team.

Redefining 'healthy diet'

PHRI scientists have spent a good part of the last two decades conducting one of the world's most extensive studies on diet and health. The findings from the international PURE study, encompassing about 200,000 participants in 27 countries, has challenged conventional thinking.

The PURE Nutrition component analyzed the food intake data of as many as 135,000 participants in 21 countries in Africa, North America, Europe, South America and Asia. The results, in five separate publications in *The Lancet* this past year, have challenged long-standing wisdom on diet and health.

We found that increased consumption of both saturated and unsaturated fats are associated with lower risk of death. In the context of today's diets, this would suggest that there is little need to further lower fat intake in most populations. Additionally, in our most recent paper in *The Lancet*, we found that dairy intake is associated with lower cardiovascular disease and mortality, irrespective of type of dairy food or amount of fat.

The impact of fats and carbohydrates on blood lipids was also studied in PURE showing that LDL cholesterol is not reliable in predicting effects of saturated fat on future cardiovascular events. Instead, the ratio of Apolipoprotein B (ApoB) to Apolipoprotein A1 (ApoA1) gives the best indication of long-term dietary effects on health.

The PURE data also showed that consumption of fruit and vegetables is low worldwide, particularly in low-income countries. Additionally, we found that consumption of three daily servings of fruits, vegetables and legumes are related to lower mortality, with little additional benefit for consumption beyond that.

Our work on sodium has shown that a sodium intake of up to 5 grams per day (2 ½ teaspoons of salt) does not increase cardiovascular disease and death. This amount is more than double the WHO recommendation of 2 grams of sodium daily (1 teaspoon of salt), a target rarely met.

"Food guidelines have been based largely on North American and European populations for decades now. We work with data from diverse settings, including less commonly studied low- and middle-income countries where under-nutrition is the major problem, so our work better informs diets for populations globally," says Dr. Andrew Mente, who works alongside Dr. Salim Yusuf, Executive Director, PHRI, and fellow PHRI nutritional epidemiology investigator, Dr. Mahshid Dehghan.

Dr. P.J. Devereaux and team nurse.

"... the condition was undetectable until Dr. Devereaux's earlier breakthrough of a simple blood test that identifies high-risk patients."

Better surgery outcomes

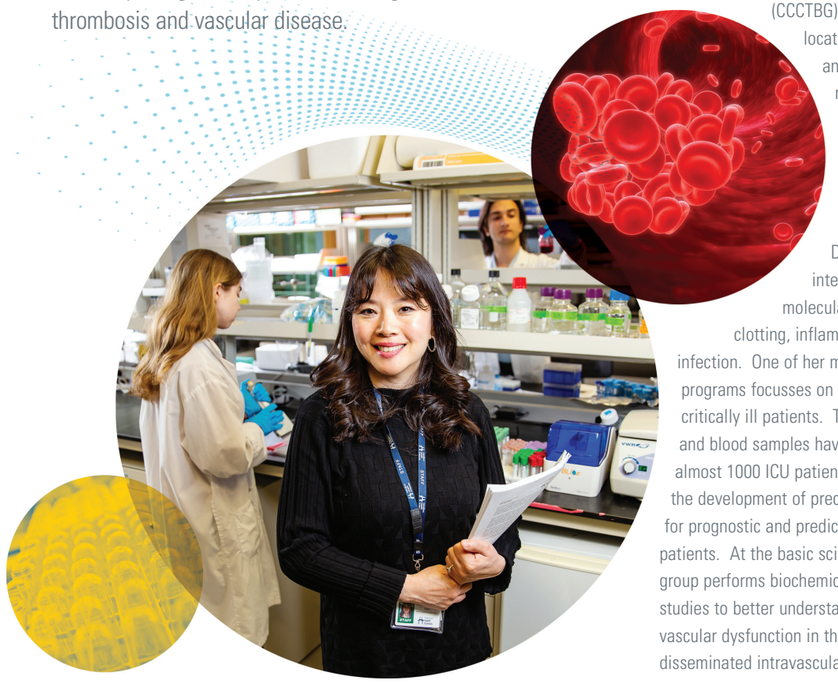
PHRI is home to the world's largest research program in perioperative medicine and surgery, involving some 80,000 patients from 30 countries. The program's lead, Dr. PJ Devereaux, made great strides in 2017-2018 around detection and prevention of post-surgery complications, in particular "we now have an option for improving outcomes for a large population of people around the world who have a heart injury after surgery," he says. About 8% of people who undergo non-cardiac surgery end up with the condition known as myocardial injury after non-cardiac surgery (MINS).

Before Dr. Devereaux's large observational study, VISION, little was known about the relationship between a heart marker in the blood after surgery (i.e. postoperative high-sensitivity troponin T [hsTnT] measurements) and MINS. Results published in *JAMA* in 2017 indicate that peak postoperative hsTnT during the first three days after surgery was significantly associated with 30-day mortality. Elevated postoperative hsTnT without an ischemic symptom was also associated with 30-day mortality, and this represented more than 90% of the MINS events. Patients with MINS have a poor prognosis for major vascular complications and mortality, and the condition was undetectable until Dr. Devereaux's earlier breakthrough of a simple blood test that identifies high-risk patients.

Building on that discovery, PHRI researchers tested anticoagulation therapy administered post-operatively for patients at risk and found that the blood thinner, dabigatran, significantly reduces the risk of death, heart attack, stroke and other vascular complications among patients with MINS, as published in *The Lancet* in 2018. "It is encouraging that we did not see an increase in major or life-threatening bleeding in patients on dabigatran," says Dr. Devereaux. "I certainly think this research helps us to hopefully get people measuring more troponins perioperatively, and allow us to actually treat these patients who have poor outcomes to substantially improve their prognosis."

THROMBOSIS & ATHEROSCLEROSIS RESEARCH INSTITUTE (TAARI)

The Thrombosis & Atherosclerosis Research Institute (TaARI), located at the state-of-the-art research facility at the David Braley Research Building (DBRB) at the Hamilton General campus, has continued to maintain excellence in education and research during 2017-18 academic year under the leadership of Dr. Jeffrey Weitz, executive director. The DBRB is shared with the Population Health Research Institute with a goal to create synergies in the basic and clinical research, thereby enabling a seamless "bench to bedside and back again" approach to complex health care problems. Our laboratories have enabled new collaborations that extend to all hospital sites as well as national and international research collaborations. TaARI remains focused on its mission to reduce death and disability from thrombotic diseases by conducting research into the pathogenesis, prevention, diagnosis and treatment of thrombosis and vascular disease.



Dr. Patricia Liaw

Dr. Liaw is a professor in the division of hematology and thromboembolism and chair of the Canadian Critical Care Translational Biology Group (CCCTBG). Her research lab is located at TaARI. She has an active research lab and mentoring program which provides a two-way bridge between basic science studies and clinical/ translational research.

Dr. Liaw's overall research interest is to study the molecular links between blood clotting, inflammation, and microbial infection. One of her major CIHR-funded research programs focusses on translational studies of critically ill patients. To date, serial clinical data and blood samples have been collected from almost 1000 ICU patients. The research has led to the development of precision medicine approaches for prognostic and predictive enrichment in septic patients. At the basic science level, her research group performs biochemical, cellular, and animal studies to better understand the pathogenesis of vascular dysfunction in thrombosis, sepsis, and disseminated intravascular coagulation.

Dr. Alison Fox-Robichaud

Dr. Alison Fox-Robichaud is a professor in the division of respirology and an integral part of the multicenter observational validation study of cfDNA as a sepsis biomarker in Canada. The DYNAMICS Study is unique in that the entire process from collection to measurement takes approximately 2 hours, thus providing a biomarker with high sensitivity and specificity in a timely manner. She is the Principal Investigator/Team Lead of "Team Sepsis: Bench to Bedside" strategic initiative at HHS which will take our laboratory techniques and integrate into routine clinical care. Team Sepsis will measure cfDNA in both adult and pediatric patients presenting to the Emergency Department. It will also determine the feasibility of having routine blood collection to accurately diagnose respiratory infections.

She is responsible for various Knowledge Translation Studies through the Canadian Critical Care Translational Biology Group and the Canadian Critical Care Trials Group.

Her research focuses on basic science research examining the role of adhesion molecules, pro-inflammatory mediators and endogenous anti-inflammatory molecules in systemic inflammation. She is also interested in the factors that control leukocyte recruitment into the liver microcirculation and how this may affect inflammation in other organs. She conducts research on the in vivo responses associated with inflammation, septic shock and fluid resuscitation.

In addition, she supervises various laboratory graduate and post graduate projects while actively contributing to improving sepsis education through a Sim One/Canadian Patient Safety Institute grant and participating in local World Sepsis Day activities.

FIRESTONE INSTITUTE FOR RESPIRATORY HEALTH

This year, the Firestone Institute for Respiratory Health (FIRH) celebrates its 40th anniversary as being a world-renowned centre for the investigation and treatment of respiratory diseases. FIRH scientists and clinicians continue to contribute to ground-breaking respiratory research with global impact. FIRH provides comprehensive in-patient and out-patient respiratory care as the regional respiratory centre for the City of Hamilton and the Hamilton Niagara Haldimand Brant Local Health Integrated Network. FIRH has a unique Chest Program that encompasses the spectrum of respiratory medicine together with affiliated head-and-neck and thoracic surgery services; all are located on one site. Clinical, research and educational activities are integrated and collaborative within FIRH. The intent is to provide exemplary clinical care, in tandem with basic and translational research inquiry, while educating and mentoring health care professionals to treat, research, teach, and lead. The strength of FIRH continues to be its focus on improving patient outcomes.

Dr. Jeremy Hirota

Accomplishments

In the 2017–18 academic year, Dr. Hirota received funding from Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council, Canadian Foundation for Innovation, and the Ontario Lung Association. These operating and infrastructure grants will enable him to further develop his internationally recognized lung immunology research program focused on chronic respiratory diseases, including asthma, COPD, and cystic fibrosis. The operating and infrastructure grants will enable him to explore

1. fundamental biology of lung epithelial cells, the cells that form the first layer of defence in the lung,
2. candidate drugs that can make existing drugs for asthma and COPD work better, and
3. tissue engineering strategies to create 3D models of lung tissue for advancing our understanding of disease processes.

Dr. Kjetil Ask,
Pleural Space Clinic

What makes McMaster University and FIRH the perfect environment to conduct research?

McMaster University's Faculty of Health Sciences, Department of Medicine, Division of Respirology, the home of the Firestone Institute for Respiratory Health, is internationally known as a centre for translational and clinical research in lung health and disease. The development, validation, and implementation of clinical tests from the Firestone have changed the way chronic lung diseases are managed globally. The integration of basic and translational research programs in the Firestone provides access to cutting edge clinical research and global leaders in lung health and disease. Dr. Hirota receives rapid feedback from clinical colleagues on the problems facing their patients and is able to shape his research questions to find answers important to patients. The integration of patient care, clinical research, and basic and translational research within the Firestone is an optimal model to advance our understandings of lung health and disease.

Future directions

In addition to his research within the Firestone, he functions as an entrepreneur advisor to the Michael G. DeGroote Initiative for Innovation (MGDII). In this role, he is looking to find ways to bring the world-class research within the Firestone to the market via intellectual property generation and commercialization. He will function as a liaison between the Firestone patients, clinicians, and researchers and the Faculty of Engineering so that interdisciplinary solutions can be generated to advance lung health and economic prosperity. As a business developer, he will identify potential opportunities, connect appropriate individuals with common interests, and shape creative funding and financing opportunities. It is his hope that commercialization of interdisciplinary research efforts focused on Firestone patient's health will create a win-win situation where patient's quality of life is improved and economic opportunities are maximized.

40th

anniversary as a world-renowned centre for the investigation and treatment of respiratory diseases

Freddy Hargreave in receipt of the 2002 Queen Elizabeth II Golden Jubilee Medal

Dr. Parameswaran Nair

Accomplishments

It is a tremendous feeling of gratification for Dr. Nair that he has been able to continue the legacy of his mentor, the late Professor Freddy Hargreave. His team has built up a translational research program in complex airway diseases, particularly in severe asthma, that directly benefits patients. The airway inflammometry laboratory processes more clinical samples than anywhere else in the world. The program has contributed to over 200 peer-reviewed publications in high-impact journals (five in the New England Journal of Medicine), attracted close to 10M dollars in funding over the past 10 years (including 10 years of Canada Research Chair funding), and over 20 undergraduate, postgraduate, and post-doctoral fellows from both Canada and abroad. The research program was further recognized by the creation of the Frederick E. Hargreave Teva Innovation Chair in Airway Diseases. The clinical impact is reflected by tertiary referrals from all over Ontario (both academic and non-academic centres) and from other provinces, and the improvement in the health care outcomes and the quality of life of the vast majority of patients whom served.

200

Number of peer-reviewed publications in high-impact journals (five in the New England Journal of Medicine) contributed by the program

10M

Dollars in funding over the past 10 years (including 10 years of Canada Research Chair funding)

20

Number of undergraduate, postgraduate, and post-doctoral fellows from both Canada and abroad

What makes McMaster University and FIRH the perfect environment to conduct research?

McMaster University and St Joseph's Healthcare have a long innovative tradition of facilitating the integration of clinical medicine and research programs. There may be a number of academic centres across the world that have much larger health sciences faculties and clinical facilities than McMaster University; however, Dr. Nair hasn't yet come across a centre where research laboratories can seamlessly support the provision of clinical care to improve the care of patients. Despite limited resources, the hurdles are kept to a minimum to integrate, both spatially and operationally, research labs and clinical services. The interdisciplinary collaboration across divisions and faculties further promotes clinical research.

Future directions

Dr. Nair has to ensure that this legacy continues. The airway inflammometry program has to be expanded into a translational immunology program. Over the past two years his team has established an airway imaging program that applies functional MRI and CT scanning into clinical evaluation of complex airway diseases. They are increasingly being approached by a number of international centres to provide clinical and research training. Over the next five years, he hopes to recruit at least four new faculty (two MDs, two PhDs) to expand the airway diseases program, extend current bioimaging and immunoendotyping sciences by introducing targeted omics technology, establish a formal airway fellowship program, integrate the COPD, chronic cough, and suppurative lung diseases research programs with the severe asthma program, all under the umbrella of a Centre for Complex Airway Diseases at the Firestone Institute for Respiratory Health.

AllerGen NCE INC.

Helping Canadians living with allergies and asthma

Asthma and allergies are on the rise—one in three Canadians lives with allergic disease; nearly three million Canadians suffer from asthma; and 50% of the nation's households are directly or indirectly affected by food allergy.
A national research team, the Allergy, Genes and Environment Network of Centres of Excellence (AllerGen NCE), is led by Dr. Judah Denburg, William J. Walsh Chair in Medicine, Professor of Medicine and Director, Division of Clinical Immunology and Allergy at McMaster University.

Dr. Judah Denburg and AllerGen team

Now in its 14th year, AllerGen has invested in over 200 research and knowledge translation projects across the country to discover and implement novel diagnostics, therapies and disease management strategies for Canadians living with allergy and asthma.

Dr. Denburg's AllerGen-supported research has discovered that cord blood hemopoietic stem cells can be used to predict allergy and asthma development. "Allergy is 'in the blood' at birth," says Dr. Denburg. "This means we may be able to develop a biomarker, leading to novel treatment targets to modify early disease trajectories."

AllerGen has integrated efforts into three high-impact, sustainable legacy platforms:

- **The Canadian Healthy Infant Longitudinal Development (CHILD) Study**, with four recruitment sites across Canada and an administrative core at McMaster, is a general population birth cohort study of nearly 3,500 Canadian children and their families being followed from pre-birth through childhood and beyond. CHILD has "already made important discoveries about the long-term health impacts of early childhood exposures, including breastfeeding, nutrition and foods, microbiome, maternal stress, and air pollution," says Dr. Denburg.

- **The Clinical Investigator Collaborative (CIC)**, operating at eight universities across Canada and one abroad, and led by investigators at McMaster, is a Phase II clinical trials group that evaluates potential drug candidates for the treatment of allergic and severe asthma. Since 2005, the CIC has undertaken 29 clinical trials and attracted nearly $28 million in R&D investment to Canada, according to Dr. Denburg. "Developing new drugs is an extremely expensive business for pharmaceutical and biotechnology companies. The CIC is expert at predicting if a potential new asthma drug will work."

- **The National Food Allergy Strategic Team (NFAST)**, a transdisciplinary food allergy consortium, studies the biology of food allergy/anaphylaxis and translates that knowledge into clinical and public health practice. NFAST research teams, which include McMaster allergists, have conducted Canada's first studies on food allergy and anaphylaxis prevalence, management, and economic burden, and have contributed to food labelling reforms, developed evidence-based guidelines for the management of food allergies in schools, and produced new findings on the genetic basis of peanut allergy.

AllerGen
Allergy, Genes and Environment Network
Le réseau des allergies, des gènes et de l'environnement

"AllerGen has united the country's top allergy/asthma researchers and provided added-value funding for research, knowledge mobilization, trainee development, networking and partnerships," adds Dr. Denburg. "AllerGen has provided invaluable legacies for, and impacts on, Canada's scientific, capacity-building, and innovation landscapes for decades to come."

FARNCOMBE FAMILY DIGESTIVE HEALTH RESEARCH INSTITUTE

The Institute was founded in 2008 and has 17 full-time faculty members including active clinicians and PhD scientists. Dr. Stephen Collins is the director. Its mission is to investigate and exploit the role of the intestinal microbiota in the maintenance of health and in the expression of disease within and beyond the GI tract. The Institute includes two important research facilities: The McMaster Genomic and Metagenomic Sequencing Facility and The Axenic-Gnotobiotic Mouse Facility that are utilized by researchers within and beyond McMaster University. The spectrum of research includes pre-clinical proof of concept studies, translational human research, meta-analyses and systematic reviews, as well as clinical trials. The Institute currently holds $15.9 million in peer-reviewed funding (in addition to the $15M CIHR SPOR grant) and supervises 67 trainees. Funding sources include CIHR (2 Foundation and 1 Team Grant), NIH and Crohn's Colitis Canada and USA. Recent successes include the identification of the role of commensal bacteria in the digestion of gluten, enabling novel approaches to treatment of celiac disease, fecal microbial transplantation as a therapeutic option in ulcerative colitis, deleterious and beneficial effects of commensal bacteria on brain function, and the identification of factors that influence the intestinal microbiota in infants.

Drs. Ines Pinto-Sanchez and Elena Verdú consult with a patient.

Food intolerance and GI Disease

Food intolerance is very common in gastroenterological practice and its etiologies are poorly understood. It is therefore a major focus of our research. Highlighting this area of research also serves to emphasize the Institute's strong translational capacity. The teams of Drs. Elena Verdú and Ines Pinto-Sanchez focus on the intolerance to wheat proteins using gliadin as a model in preclinical and clinical studies.

"While there is certainly a genetic predisposition underlying immunological sensitivity to gliadin, studies have shown a four-fold rise in celiac disease over the past 40 years suggesting that environmental factors play a role in this condition" says Dr. Elena Verdú, president of the Society for the Study of Celiac Disease, professor and Canada Research Chair holder at the Farncombe Institute. "Our research has focused on the digestion of wheat proteins by the proteases of commensal bacteria in the upper GI tract. Some bacteria cleave gluten into highly immunogenic peptides that stimulate a damaging host immune response and the clinical presentation of celiac disease. However, we have also discovered that certain bacteria cleave gluten into non-immunogenic peptides and this constitutes a novel therapeutic strategy that we propose to test in the clinic." Dr. Verdú's team, including her senior fellow Dr. Alberto Caminero, are identifying specific bacteria and the enzymes, including elastase, that promote the non-immunogenic digestion of gluten. "An imbalance of the microbiota may be one of the environmental factors contributing to the increased prevalence of celiac disease" says Dr. Verdú.

Dr. Ines Pinto-Sanchez is a recently appointed assistant professor in the Department of Medicine who is conducting clinical research on celiac disease and other forms of wheat intolerance in the Farncombe Institute. She recently established a celiac disease clinic where, with her team of nutritionists, she is translating preclinical research findings into clinical practice. "Strict adherence to a gluten-free diet is a lifelong commitment for patients with celiac disease and is not easy to achieve. Inadvertent contamination is common and has clinical consequences. Furthermore, it is expensive, nutritionally restrictive and poses major inconveniences to patients and their families" says Dr. Pinto-Sanchez. "It is crucial that patients with celiac disease receive adequate education at the time of diagnosis and receive close monitoring of treatment compliance. Our celiac clinic, the first one of its kind in Canada for adults, provides dedicated care for celiac patients through a multidisciplinary team that includes a gastroenterologist with expertise in celiac disease and nutrition, expert dietitian and access to other specialties." Dr. Pinto-Sanchez is conducting research on a method to detect gluten in stool and urine in order to assess compliance in celiac patients. "We are also examining potential new therapies which include a permeability modulator (currently entering phase 3) and are ready to exploit the findings from the Verdú lab regarding novel microbiota and enzymatic treatments of celiac disease."

These teams, in collaboration with other members of Farncombe Institute, are also examining the role of wheat protein-induced low-grade immune responses as a basis for symptom generation is patients with functional GI disorders such as irritable bowel syndrome – the most prevalent GI condition in the world.

CHANCHLANI RESEARCH CENTRE

Jaya and Vasu Chanchlani provided foundation funding for the Chanchlani Research Centre.

The Chanchlani Research Centre (CRC) was established in 2011 after a generous donation was made by Vasu and Jaya Chanchlani to McMaster University. The Chanchlani Research Centre pursues research studies seeking to add to the collective knowledge in the areas of genetics, genomics, and environmental risk factors for chronic diseases across the life course, with special emphasis on high risk groups including ethnically-diverse populations, those of low socioeconomic status and women.

80

Peer-reviewed papers published by PGP faculty

Objectives of the CRC

1. To provide a stimulating environment to create new research collaborations which culminate in acquiring peer review grants, industry funding and private/corporate funding;
2. To provide core faculty with infrastructure to acquire and analyze their data, and,
3. To promote mentoring and training of students at all levels including undergraduate, graduate, and post-doctoral fellows.

FACULTY MEMBERS WHO PARTICIPATE IN CENTRE RESEARCH INCLUDE:

Dr. Sonia Anand (director, Departments of Medicine and Health Research Methods, Evidence, & Impact), Dr. Joseph Beyene, Dr. Russell de Souza and Dr. David Meyre (Department of Health Research Methods, Evidence, & Impact) Dr. Guillaume Pare (Department of Pathology), Dr. Zena Samaan (Department of Psychiatry)

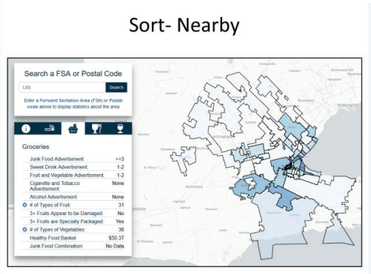
Featured Project:

The Nutrition, Metabolomics, and Genomics in Birth Cohorts Project and Contextual Map Analysis of Canadian Communities as part of the Canadian Alliance of Healthy Hearts and Minds (CAHHM) project

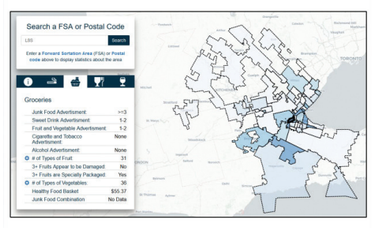
Featured Researcher

Dr. Russell de Souza led the creation of a Canada-wide community map which characterized the contextual environments which may influence the development of key cardiovascular risk factors. “The first step in understanding how where we live impacts our health is documenting features of where we live. Downtown Hamilton is not like rural Nova Scotia, and this project will help us understand how differences in built environment features, such as access to public transit, healthy foods, cigarettes, and alcohol influence regional health discrepancies.”

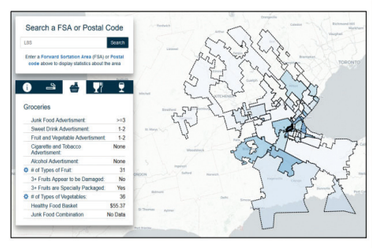
Sort- Nearby



Sort- Province



Sort- Country



Global Health Research Award:

In addition to their generous gift for the Centre the Chanchlani Global Health Research Award was created by the Chanchlani family and McMaster University in 2012 to recognize a leading scholar in the area of Global Health. The Scholar is selected by an internal committee in conjunction with the Global Health Program. In 2018, Dr. Dariush Mozaffarian from Tufts University was the recipient, and he gave a number of lectures in Hamilton with respect to Global forces of nutrition.

2018: Chanchlani Global Health Research Award Recipients

Dr. Dariush Mozaffarian,
Tufts University
"A Global Perspective in Preventing Cardiometabolic Diseases: From Discovery to Policy"

Dr. Camara Phyllis Jones
Morehouse School of Medicine
"Tools for Achieving Health Equity: Allegories on "Race" and Racism"

Past Recipients include:

2017: Dr. John Ioannidis, C. R. Rehnborg Chair in Disease Prevention at Stanford University, professor of Medicine and Health Research and Policy presented "Improving Research Practices: A Global Challenge" on February, 6, 2017.

2016: Dr. Vikram Patel– Centre for Global Mental Health presented "The Black Dog: Why we don't care" on February 23, 2016.

2015: Professor Ab Osterhaus, an esteemed Virologist, and head of the Department of Virology of the Erasmus MC Rotterdam presented his lecture entitled "From Zoonosis to Pandemic in a Changing World" on February 25, 2015.

2014: Dr. Hans Rosling, PhD, MD professor of International Health, Karolinska Institute, co-founder & chairman, Gapminder Foundation

GERIATRIC EDUCATION AND RESEARCH IN AGING SCIENCES (GERAS) CENTRE

GERAS Centre for Aging Research

The aging population is the biggest challenge facing our healthcare system today. In Canada we expect that 25% of our population will be over the age of 65 by 2041, almost doubling the population from 2016. To ensure the sustainability of our healthcare system during this profound demographic shift, we need to examine innovative solutions and models of care that meet the needs of older Canadians. We know that a better approach is needed to support seniors to live independently longer with a focus on supporting people moving from hospital to home. GERAS is leading the way in practical innovations, new models of care and clinical interventions and tools for seniors who are at "at-risk", their caregivers and healthcare professionals.

The research at the GERAS Centre is inspired by seniors and working alongside the largest network of geriatricians and specialized geriatric teams in our region. Our focus on training the next generation of clinicians and scientists ensures we continue to search for new and better ways to support seniors.

Each of our projects and programs tackle one or more of the biggest challenges facing our seniors and our healthcare system today: dementia, frailty, falls and fractures, and empowering patients and caregivers. The investigators (Drs Justin Lee, Sztramko and Ioannidis) highlight innovations that can make a difference to seniors every day in meaningful ways.

In 2017, the World Health Organization (WHO) declared "Medication Without Harm" to be its Global Patient Safety Challenge in recognition that sub-optimal prescribing and medication use is one of the leading causes of patient injury and avoidable harm. **Dr. Justin Lee** and his team are responding to this challenge by developing multiple innovations to optimize patients' use of medications in order to improve their health and the sustainability of the healthcare systems. His work is enabling a better understanding of a vulnerable group of individuals – those who tend to be older, sicker and use two thirds of Ontario's healthcare budget – known as "high cost healthcare users", as well as the development of tailored solutions to keep the healthy and out of hospital. Results from an initial study of over 700,000 older adults in Ontario demonstrated that our current use of several specific medications is sub-optimal and associated with high cost user's poorer health, and the increased need for healthcare utilization in the future.

Dr. Justin Lee

With an interdisciplinary expert team including members of the Division of Geriatric Medicine, he is evaluating and developing new drug policy and behavioural science choice architecture interventions to positively influence prescribing and medication use at a population level. He is also conducting a pragmatic pilot randomized controlled trial entitled Improving Medication PRescribing for Ontario's Vulnerable Elderly High Cost healthcare Users (IMPROVE-HCU). IMPROVE-HCU is testing the feasibility of a comprehensive medication optimization and deprescribing intervention with virtual post-discharge telemedicine follow-up. With full integration into a new innovative electronic medical record system that is now becoming widely adopted across Canada, the IMPROVE-HCU intervention serves as a potential prototype for a network of leading medical centres across North America and has the potential to improve health and transitions in care for this vulnerable group.

Dr. Sztramko's research focuses on improving the lives of caregivers of patients who have dementia. **Drs. Richard Sztramko**, Anthony Levinson and the Division of Geriatric Medicine have created an online platform for caregiver education and wellness (www.igericare.ca). The site provides online lessons on medical care and practical tips for caregiving, as well as information on how to access resources in the community. Live events are hosted for caregivers, including health care workers, to learn relevant information and ask questions on a monthly basis. Micro-learning through a structured email curriculum and subscriptions to the site are also offered, and prescription pads are available to provide a customized experience. He has received funding through the Centre for Aging and Brain Health Innovation, and subsequently the Researcher Clinician Partnership Program (RCP2); the Hamilton Health Sciences Foundation; the Alzheimer's Society of Hamilton and Halton; Regional Geriatrics Program Central and the GERAS Centre. In nine months iGeriCare has reached over 50,000 users and successfully launched over 10,000 lessons. Current research includes evaluation of the impact of the platform on caregiver self-efficacy, quality of life, caregiver burden, and a knowledge implementation strategy in clinical settings across Ontario.

Dr. Richard Sztramko

igericare.ca

50,000

Number of users iGeriCare has reached in nine months

Ably Bed

GERAS has built a reputation for practical, intervention-focused research that reaches the front lines of care quickly and is implementable across different settings. **Dr. George Ioannidis**' research contributes to the "Living Lab" at the GERAS Centre. The Living Lab provides an ecosystem where we can work together with patients, families, and community/industry partners to co-create innovative solutions to improve patient care and quality of life. Through access to real clinical settings, we collaborate with industry and innovators to rapidly develop, adapt, and test prototypes, products and services. As part of the Living Lab, Dr. Ioannidis has partnered with Ably Medical, a Norwegian Innovator, in designing and redefining what a hospital bed can be from the ground up. The bed has sensors built in to monitor the patient's health data and designed to model the human spine to assist with patient movements. The hope is that the Ably Bed will lower costs, and improve the quality of care for patients. Dr. Ioannidis has also partnered with Darmiyan, an innovative company based out of San Francisco, USA, to assess a new magnetic resonance imaging (MRI) analysis software platform for detecting Alzheimer's disease. This collaboration will collect brain MRI scans from older adults with cognitive impairment and process them using specialized software. Our aim is to determine if the software is capable of predicting Alzheimer's disease. Early detection is vital for patient management and changing disease progression. Dr. Ioannidis is incredibly proud of the benefits that the GERAS' Living Lab has on our health care system, and more importantly to the older adults in our community and beyond.

Dr. George Ioannidis

Reports: Endowed Chairs and Professorships

ABBVIE CHAIR IN EDUCATION IN RHEUMATOLOGY

Dr. Alfred Cividino

Dr. Alfred Cividino's focus for the chair position continues to be the expansion of awareness and education about rheumatic diseases to physicians, residents and students.

The chair continues to participate in undergraduate and postgraduate teaching.

Educational activity in the Division of Rheumatology has been recognized by The Arthritis Society with a grant from the rheumatic disease unit's annual competition.

In continuing the commitment to education in rheumatology, Dr. Cividino co-chaired the third 'Annual Clinical Day in Rheumatology'. The event was very well received and attended by over 200 family physicians and allied health professionals. Funds raised will help support ongoing research activity in the Division of Rheumatology.

Nationally, the chair's efforts in our "Become a hero, become a rheumatologist" campaign continues to bear fruit with many students and residents seeking clinical opportunities in rheumatology. Training programs across the country have many excellent candidates applying for training in rheumatology. At McMaster we have increased training to three residents per year. ■

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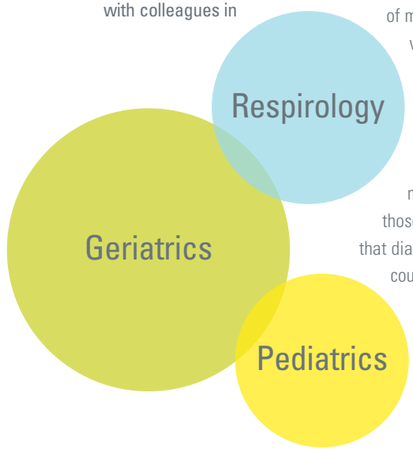
Endowed Chairs or Professorships

ACTAVIS CHAIR IN RHEUMATOLOGY FOR BETTER BONE HEALTH

Dr. Jonathan D. Adachi

With the ultimate goal of improving the quality of life of those with rheumatologic diseases, we endeavour to continue to build collaborations with colleagues in Geriatrics, Respirology and Pediatrics, and to increase our research capacity through our training programs in undergraduate, graduate, undergraduate medical and post-graduate medicine and rheumatology. Through these collaborations and training programs we will further increase and improve our knowledge about the effects of aging and frailty on various rheumatological conditions, the use of technology, including Apps, in caring for patients and assessing health, and understanding the true impact of rheumatologic disease on activities of daily living and physical functioning.

This year our investment in increasing and improving the research training and experiences of our trainees has proven to be extremely fruitful. We had an unprecedented number of abstract submissions to the American College of Rheumatology and Canadian Rheumatology Association Annual Scientific meetings reporting research findings from studies being done both here at McMaster and in collaboration with national and international research teams. We also saw an increase in the number of manuscripts submitted for publication by our trainees which we anticipate will continue over the next year. Not only have we seen a significant increase in the number of research submissions, but we have also increased the breadth of our work with more trainees working in areas that are multidisciplinary.



In collaboration with our colleagues in geriatrics and health research methodology, we have examined frailty and fractures in diabetics and in those with rheumatoid arthritis. In diabetes we believe that frailty is the reason that diabetics fracture despite having higher BMD levels then their non-diabetic counterparts. We have described frailty in patients with rheumatoid arthritis and shown the relationship to fractures. Finally, in a project lead by our geriatric colleagues we have developed a fracture risk assessment tool for those in long-term care and will be examining its use in those using homecare.

In the coming year we will be assessing frailty in other rheumatology populations building on what has already been done. This will include expanding our collaborations beyond our geriatric/rheumatology group and potentially beyond McMaster. We also plan to submit strategic operating grants and catalyst grants which will allow us to further the work that has already been done at McMaster and expand our capacity to collect important outcomes in our unique clinical/research setting. In anticipation of writing these grants, we will be collecting data from our clinical populations and working with our trainees in the development of research protocols and study design. ■

AMGEN CANADA CHAIR IN NEPHROLOGY

Dr. Richard C. Austin

Established in 2005 via a generous gift from Amgen Canada Inc., the goal of the Amgen Canada Chair in Nephrology is to focus on the field of clinical research in nephrology and to contribute signficantly to clinical work, teaching and research in nephrology at McMaster University. Although it is well established that patients with impaired kidney function are at high risk of developing heart disease, the underlying mechanisms are relatively unknown. The chair and the Division of Nephrology have a particular interest in better understanding the connection between kidney and heart disease. In addition, the chair is also responsible for mentoring new researchers and inspiring them to achieve insights and innovations that will reduce the risk of kidney disease and its complications.

The overall goal of Dr. Austin's research program is to elucidate the underlying cellular stress pathways that contribute to cardiorenal disease, including vascular calcification. His other interests include the identification of genetic and cellular factors that contribute to diabetes and obesity. This has led to the discovery of several novel cellular factors that influence the development of vascular calcification, the underlying cause of heart disease in patients with impaired kidney function. Some of the major discoveries in Dr. Austin's laboratory include: (i) defining the role of endoplasmic reticulum (ER) stress in atherosclerotic lesion growth and rupture, (ii) demonstrating a causal role of TDAG51 in lesion development, plaque rupture and vascular calcification, and (iii) establishing a causal relationship between ER stress and vascular calcification. This has lead to the identification of anti-GRP78 autoantibodies that accelerate the development of atherosclerosis, the underlying cause of heart disease. Furthermore, Dr. Austin and his research team have shown that attenuation of ER stress can suppress many of the downstream pathways that contribute to cardiovascular and renal diseases. Dr. Austin has recently reported the novel finding that human mutations in the PCSK9 gene modulate kidney function contribute to heart disease.

Dr. Austin and his research team have utilized state-of-the-art biochemical and molecular approaches, as well as established mouse models of cardiometabolic and cardiorenal disease to better explain the underlying mechanisms responsible for kidney dysfunction and vascular calcificatioin. A number of these recent findings from Dr. Austin's laboratory have been published in many of the top scientific journals. Importantly, many of these discoveries have become the cornerstone for the development of novel therapies and detection methods aimed at reducing the risk of cardiorenal disease and its complications. To further pursue his research program, Dr. Austin was recently invited to spend a year at the Amgen San Francisco research site as a visiting scientist where he was involved in identifying cellular targets for the detection and treatment of cardiorenal disease.

Dr. Austin's major research goals for the upcoming year are to further investigate how vascular calcification arises in end-stage renal disease and to develop novel therapies that inhibit this major complication. Given that vascular calcification is the major cardiovascular complication in patients with chronic kidney disease, and there is currently no treatment strategy, the identification of the underlying mechanisms will allow for the development of novel therapeutics for this disease. Additional novel studies to assess the role of PCSK9 and anti-GRP78 autoantibodies in cardiorenal disease are currently underway.

Dr. Austin's role as Research Director is to further enhance the interaction between biomedical scientists and clinicians/nephrologists in the Divisions of Nephrology and Urology. We have now implemented a translational research program that encompasses a bench to bedside approach. Formal research meetings are now underway to identify important and relevant research areas in nephrology that directly impact patient care and treatment. This will allow both clinician scientists and researchers to develop a dynamic and relevant research program that will tackle the major issues relevant to cardiorenal function and pathology. This translational and cooperative approach represents a major initiative for the development of novel therapeutic strategies that focus on our major scientific achievements and discoveries. ■

ANDREW BRUCE DOUGLAS CHAIR IN NEUROLOGY

Dr. John Turnbull

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Patients with motor neuron diseases

The Andrew Bruce Douglas Chair in Neurology was established in March 2006 to further the clinical, educational, and research aspects of Amyotrophic Lateral Sclerosis (ALS) at McMaster. With respect to clinical activity, we are a premier clinical site in Canada for the treatment of ALS, and follow about 350 patients with motor neuron diseases, which places us among the largest ALS clinics in Canada and, indeed, North America. We remain grateful to Hamilton Health Sciences for their ongoing support of the clinic, which includes respiratory technology, speech and language support, social work, seating and mobility support, equipment loans (with the ALS Society of Ontario), and is ably coordinated by Ms. Barbara Miller. Ms. Shelley Curry provides the logistic and secretarial support. We have close collaborations with Dr. Bruno Salena and Dr. Andy Freitag for gastrointestinal and ventilation issues, respectively, and Dr. Peter Varey for physiatry. With respect to education, medical students, residents, and fellows rotate through the clinic, and it is an especially valued rotation for final year neurology residents. Two undergraduate students undertook senior thesis projects this last year, and both have been accepted into Canadian medical schools. Dr. Daniela Trapsa and Mrs. Jane Allan coordinate our clinical research activities. We have six clinical trials presently ongoing. Our basic research continues as we explore the possibility that ALS terminally involves de-differentiation of motor neurons, which may have therapeutic implications. We have been successful, in collaboration with Drs. Yingfu Li and Bruno Salena, in securing research funding from the Weston Foundation to investigate the potential of DNA/RNA hybrids as a diagnostic probe for ALS. This work has resulted in a blood probe of acceptable sensitivity and specificity, and more work is ongoing and planned. We are collaborating with Dr. Matt Miller in Biochemistry, looking at the effect of influenza virus vaccination or infection in the progression of ALS. We are collaborating with Dr. Venina Bello Hass in developing a quality of life scale for ALS patients. Unfortunately, in spite of our work here and elsewhere, advances that fundamentally affect ALS (and indeed all neurodegenerative diseases) remain elusive. ■

ASTRAZENECA CHAIR IN RESPIRATORY EPIDEMIOLOGY

Dr. Malcolm Sears

Dr. Sears has focused his research interests on the developmental origins of asthma and allergy, as founding director of the Canadian Healthy Infant Longitudinal Development (CHILD) Study funded by CIHR and the Allergy, Genes and Environment (AllerGen) Network of Centres of Excellence. This large national longitudinal epidemiological study, involving 3,455 families and numerous investigators across Canada, is becoming internationally renowned for its research findings. He also continues to participate in analyzing and publishing data from his first longitudinal birth cohort study of 1000 children in New Zealand, commenced in 1972-1973, and now analyzing data from assessments at age 45 years.

The Canadian study was initiated in 2008 as an intensive investigation of factors responsible for development of allergy and asthma, with emphasis on gene-environment interactions. A very broad definition of the environment included not only indoor and outdoor air, but psychosocial environment including maternal stress, infections and nutrition. This has allowed expansion of the scope of the study to include the early origins of obesity, metabolic diseases including diabetes, cardiovascular disease and neurodevelopment. All children have now completed their assessments at age 5-years, with over 90% retention and complete data for most components available for some 80% of the cohort.

Several novel studies have been added to CHILD, including highly informative studies of the infant microbiome and its impact on immune development. Low levels of certain bacteria in the gut of infants in early life predicted a higher risk of development of wheezing with atopic sensitization, indicating a potential pathway to asthma and, importantly, a potential opportunity for primary prevention. Other work has identified early introduction of 'allergenic' foods as effective in reducing sensitization to these foods and reducing the risk of the "atopic march" in children. Numerous analyses in the full cohort and in sub-cohorts are now in progress in multiple institutions across Canada, with increasing involvement of international collaborators. These include studies of environmental pollutants, sleep disorders, neurodevelopment, metabolic disorders, nutrition including sophisticated analyses of components of breast milk, and development of Genetic Risk Scores for several diseases. A great strength of the study is having collected data and biological samples from mothers and most fathers, in addition to the wealth of data collected in serial assessments of the children.

Plans are now well established for continuation of the CHILD Study beyond five years, with multidisciplinary assessments of the cohort at age 8-9 years now in progress, and, providing adequate funding can be obtained, follow-up will continue at 11-12 and 14-15 years. Studies at these ages will provide critical data on health and development in pre-pubertal, pubertal and post-pubertal children. In July 2017, Dr. Sears passed the director's role on to associate professor Padmaja Subbarao, based at The Hospital for Sick Children, but with a cross-appointment at McMaster. He remains heavily involved in the study as chair of the Publications Committee, and chief editor of the numerous publications now emerging from this highly productive study. To date, 55 peer-reviewed publications of primary data from CHILD have been published, many already highly cited, along with 16 review papers, and over 230 abstracts presented at national and international meetings, many of which will become full publications. These scientific papers, and resulting knowledge mobilization, will provide critical information to allow development of preventative and treatment measures for many diseases with their origins in childhood. ■

AUDREY CAMPBELL CHAIR IN ULCERATIVE COLITIS RESEARCH

Dr. Paul Moayyedi

Established in 2010 via a generous gift from the daughters of the late Audrey Campbell (Linda Campbell, Gaye Farncombe and Susan Grange) via the Crohn's and Colitis Foundation of Canada, the goals of the Audrey Campbell Chair in Ulcerative Colitis Research are to provide leadership in research relevant to improving the health of persons with ulcerative colitis, promote collaborative research across disciplines, and attract outstanding students, research associates and faculty to McMaster University.

Canada has the highest incidence of inflammatory bowel disease (IBD) in the world and is rising rapidly. It is estimated that almost 1% of Canadians will suffer from IBD in the next 10 years with preteens and adolescents having a particular increase in incidence.

> "Canada has the highest incidence of inflammatory bowel disease (IBD) in the world"

Over the past year, Dr. Moayyedi was the principal applicant on a $12.5 million CIHR grant to study how gut bacteria as well as how diet might interact to cause ulcerative colitis and Crohn's disease. Another important component of this grant is understanding why patients with these diseases are particularly prone to suffer from anxiety and/or depression. We have attracted a further $20 million from various sources to conduct this work. We have formed the IMAGINE network, which involves 17 centres across Canada including all major universities and multidisciplinary researchers such as gastroenterologists, paediatricians, epidemiologists, immunologists, microbiologists, psychiatrists and psychologists. This study is being coordinated at McMaster University and the Farncombe Family Digestive Health Research Institute under his leadership. This is a five-year study that promises to find cures for at least a subset of patients with these diseases, as well as ways to better personalize the treatment of Crohn's disease and ulcerative colitis.

We published the first randomized trial in the world that evaluated transplanting healthy stool into patients with ulcerative colitis could bring them into remission. This trial was positive with a success rate similar to current therapies. This is proof of concept that changing gut bacteria can improve ulcerative colitis. We now have up to 4-years follow-up on some patients who have remained in remission on no medication other than fecal transplants with no relapse of their disease. This paper has been cited over 330 times and was among the top 0.1% cited articles in its field. Our work has been repeated by others and so far three research centres have replicated our findings with similar studies. We still need to understand better why it is successful in some patients and not others so we can improve the effectiveness of this approach and this will be achieved through the IMAGINE network.

Dr. Moayyedi has 378 publications that have been cited over 41,500 times. This places him as the 5th most cited author in gastroenterology in the Google Scholar database. He published 33 peer-reviewed papers and with a total of 3,943 citations in 2018. He gave nine international lectures in Vienna, Poland, US, Hong Kong and Thailand in 2018. He also gave four presentations at national meetings. The was chosen as the 2018 recipient of the Research Excellence Award by the Canadian Association of Gastroenterology.

This year has been appointed as assistant dean of research to promote clinical research at McMaster University and across Hamilton. He is currently the joint coordinating editor of a Cochrane group based at Farncombe Family Digestive Health Research Institute. This supports all gastroenterology guidelines in Canada, as well as many US clinical guidelines that guide doctors on how to best treat patients using evidence-based medicine principles. In 2018, he chaired the joint US/Canadian guidelines on dyspepsia management as well as leading the Canadian guideline on irritable bowel syndrome. He was also the methodology lead on the US irritable bowel syndrome guideline. Dr. Moayyedi was a methodologist on the Canadian guidelines on the management of fistulizing Crohn's disease in adults and a separate guideline for pediatric Crohn's disease. He is also V-P, quality affairs in the Canadian Association of Gastroenterology. This improves the quality of care we give to patients, and we have completed guidelines on how to give best quality care to IBD patients. The first IBD quality guidelines worldwide has been submitted for publication and a platform to evaluate quality of care by the Canadian Association of Gastroenterology will be available in 2019. This will improve the care of all IBD patients in Canada.

IMAGINE network

17 centres across Canada and multidisciplinary researchers: gastroenterologists, paediatricians, epidemiologists, immunologists, microbiologists, psychiatrists and psychologists

In the coming year we plan to:

1. Continue to develop the IMAGINE network to coordinate research across Canada for new approaches to treating patients with IBD. We will also better understand how to manage anxiety and depression that is associated with these diseases.
2. Improve our understanding of how fecal transplant therapy works in ulcerative colitis.
3. Continue to support Canadian and US guidelines on the management of IBD and other GI diseases.
4. Further develop quality measures that will improve the care of IBD patients across Canada. ■

BAYER CHAIR FOR CLINICAL EPIDEMIOLOGY RESEARCH IN BLEEDING DISORDERS

Dr. Alfonso Iorio

Developing new ways to improve the treatment of patients with bleeding disorders is the priority for the new Bayer Chair for Clinical Epidemiology Research and Bleeding Disorders at McMaster University. Bleeding disorders are a group of diseases that share the inability to form a proper blood clot. Dr. Iorio's focus as the research chair will be primarily on inherited blood disorders, such as hemophilia A, hemophilia B and von Willebrand disease. Since being named as the chairholder, Dr. Iorio has had 11 publications and been working on the following activities:

1) Completion of the implementation activities needed for the uptake of the Canadian Bleeding Disorders Registry by all Canadian Hemophilia Centers belonging to the Association of Hemophilia Centers Directors of Canada. This registry is hosted, maintained and analyzed at McMaster, and supported by the Provinces and Territories via Canadian Blood Services and HemaQuebec.
2) Completion of an International Society for Thrombosis and Haemostasis Factor VIII and Factor IX standardization committee program to issue guidelines for performing individual population PK based profiles for hemophilia patients. The program was lead by the chairholder. IN 2017 the ISTH recommendation was issued, in 2018 a broader explanatory and educational document (ref 4)
3) Research projects connected to the Web Accessible Population PK service (WAPPS-Hemo), including expanding the network to about 300 centers worldwide, exploring the relevance of baseline (ref 1), exploring on user attitudes (ref 3).
4) Completion of the coreHEM project, setting a core outcome set for gene therapy in hemophilia (ref 7) and related dissemination activities, including presentation at WFH and iHTA international
5) Transition from the chair position of the Data and Demographics committee of WFH to the co-chair position of the World Bleeding Disorder Registry initiative (WFH). ■

BORIS FAMILY CHAIR IN EDUCATION AND INTERNAL MEDICINE

Dr. Akbar Panju

It gives me great pleasure to provide a report of the activities with regards to the Boris Family Chair in Education and Internal Medicine for the Department of Medicine annual report.

Firstly, I would like to thank the Boris family for this chair, which I have been the holder of since its inception.

I continue to be the division director of general internal medicine (GIM) at McMaster University. The Division of General Internal Medicine is a vibrant division providing clinical care, educational, and research activities.

As a holder of the chair, my activities have focused on the Boris Academic Clinic which is based at the McMaster University Medical Centre.

The Boris Clinic's vision is to provide a world class centre of excellence for ambulatory care and we have done our best in providing excellence in care, education, and research. Our mission for the Boris Clinic has been to provide transformational care that is patient-centered, on time and easily navigable. We also strive to provide an exceptional teaching and research environment that is aligned with our corporate strategic pillars promoting best care for all.

My major focus has been to create and work on the General Internal Medicine Rapid Assessment Clinic and the Ambulatory Clinical Teaching Unit.

Recently, we completed a survey requesting feedback from our learners, our patients, and from the physicians who work in the clinic. The experience that our residents received in the Ambulatory Clinic were extremely positive. We also had great satisfaction by our patients. There were certain areas that the physicians identified that we could do better and we are working on that.

We recently had a strategic planning meeting and during that meeting we defined future directions for the Boris Clinic. These include focusing on innovation in the Ambulatory Care Clinic, use and evaluation of point-of-care ultrasound in outpatient clinic, continue to work with other specialties in medicine in order to provide cross specialty consultation in an expediate fashion. We also felt that quality improvement for the Boris Clinic was very important. We will continue to have annual patient satisfaction surveys done in the Boris Clinic.

In addition to my work in the Boris Clinic, I continue to provide educational activities in undergraduate, postgraduate and continuing health education. I continue to be the chair and director of the McMaster Internal Medicine Review Course which attracts over 900 physicians from across the country.

As the division director of general internal medicine for the last 20 years, I have been fortunate in being involved in recruiting academic general internists both for inpatient and outpatient activities. The division of general internal medicine has grown over the last five years and we have multiple areas where we carry out our scholarly activities. Overall, the last twelve months have been extremely successful for general internal medicine and we have been able to maintain our mission of excellence in clinical, education and research.

I am grateful to the Boris family for giving me the opportunity to carry out activities of general internal medicine and the Boris Clinic. ■

ELI LILLY CANADA CHAIR IN OSTEOPOROSIS

Dr. Alexandra Papaioannou

Dr. Papaioannou is a professor in the Department of Medicine at McMaster University and geriatrician at Hamilton Health Sciences. She is the executive director of the GERAS centre for aging research. The centre's mission is to make life better for older adults by bringing the best research to the frontlines of care as quickly as possible.

Building on a programmatic program of research for preventing and managing frailty, Dr. Papaioannou is leading the next phase of her frailty research involving interventions in frail older adults to promote healthy aging. Funded by a large CIHR grant, the RCT trial is the first of its kind in a community-based population to examine the effectiveness of a multi-modal approach to frailty rehabilitation in over 300 participants. They hypothesize that the model will improve physical function and reduce frailty. Dr. Papaioannou has also received funding from the PSI foundation. This grant will support a trial, that is also a first of its kind, to examine the feasibility of a RCT trial comparing a preoperative multi-modal frailty intervention to usual care in pre-frail/frail older adults undergoing elective unilateral hip or knee replacement. They hypothesize that a multi-modal intervention targeting exercise, vitamin D and protein supplementation, and a reduction of poly-pharmacy will synergistically improve pre and post-operative frailty status and physical function in pre-frail/frail patients undergoing hip or knee replacement surgery. Following the completion of the trials, the multi-modal approach should be implemented within our community and beyond.

Dr. Papaioannou and the GREAS team, with the support by the Ministry of Health and Long-Term Care (MOHLTC), has also developed the Fracture Risk Scale (FRS). The FRS is embedded within the RAI-MDS (Resident Assessment Instrument Minimum Data Set) - 2.0 or LTCF versions to assess fracture risk for long term care residents. Once high-risk residents are identified, strategies can be put into place to prevent fractures, and improve the care and quality of life for residents. The FRS requires no additional documentation or resources, does not require bone mineral density testing and has been implemented throughout Canada and internationally. In Canada, the FRS is available through PointClickCare as an outcome summary report.

The aim of Dr. Papaioannou's research focus is to lead innovation and learning for the benefit of our community and the world. Dr. Papaioannou believes that by maximizing the participation in older adult everyday life, this will enable people to age with dignity and independence. ■

ELI LILLY CANADA/MAY COHEN CHAIR IN WOMEN'S HEALTH

Dr. Shannon Bates

I am very honored to have held the Eli Lilly Canada/May Cohen Chair in Women's Health since January 2014. Dr. Cohen, a former associate dean and professor in the Faculty of Health Sciences well known for her leadership in the field of women's health and contributions to gender equality within the medical profession, is an important role model for me and for other women in medicine. The Eli Lilly Canada/May Cohen Chair in Women's Health was established in 1998 with funding from Eli Lilly Canada Inc. The chair is responsible for developing an awareness of the current activities in women's health that are in place in the broader academic and health network and for the promotion of McMaster as a leader in women' health. The chair will make contributions to the education programs of the faculty, remain a leader in the field and, where appropriate, be involved in clinical work that informs the research agenda.

The support of the Eli Lilly Canada/May Cohen Chair in Women's Health has been instrumental in allowing me to pursue my interests related to women's health. My clinical and academic work focuses on women's issues in thrombosis and anticoagulant therapy, especially as they relate to pregnancy, assisted reproduction, and hormonal therapy. My goal is to enhance the care of women in these settings through physician and patient education, development and dissemination of evidence-based practice guidance, advocacy, and participation in related research.

With reorganization of the local thrombosis service this year, I increased my half-day clinics devoted to women's health and thrombosis from four to six per month. During these clinics, I see women from throughout the region and supervise medical students, local and elective internal medicine and hematology residents, residents in general internal medicine, and thrombosis fellows.

This year, we were able to start recruiting locally for a CIHR-funded study on which I am a co-applicant that is examining the utility of a new diagnostic strategy in pregnant women with suspected deep vein thrombosis. We should also soon be able to recruit for another study assessing the feasibility of a randomized trial in women with antiphospholipid antibody syndrome and recurrent pregnancy loss. I had the pleasure of co-supervising two residents on a systematic review and meta-analysis examining the ability of a single negative ultrasound to rule out deep vein thrombosis in pregnant women. The results of that study were presented orally at the annual meeting of the Canadian Association of Emergency Physicians and have been submitted for publication.

I had the opportunity to present educational sessions on thrombosis and women's reproductive issues at the XXVI Congress of the International Society on Thrombosis and Haemostasis (ISTH) in Berlin, Germany, the 13th Annual McMaster Update in Thromboembolism & Hemostasis, and the Dalhousie University Hematology Symposium; as well as at annual meetings of the Canadian Society of Internal Medicine and Thrombosis Canada. I was also asked to deliver a lecture on gender inequities in health research for the Masters of Science program in Global Health. My work as chair of an international panel developing evidence-based guidelines on the diagnosis, prevention and treatment of venous thromboembolism in pregnancy for the American Society of Hematology continued. These guidelines are now complete and will be published in the fall of 2018. The manuscript related to another guideline initiative in which I participated *The Society for Obstetric Anesthesia and Perinatology Consensus Statement on the Anesthetic Management of Pregnant and Postpartum Women receiving Thromboprophylaxis or Higher Dose Anticoagulants* was published in early 2018. I continued to serve on the Medical Advisory Committee of the Foundation for Women and Girls with blood disorders. ■

FARNCOMBE FAMILY CHAIR IN DIGESTIVE HEALTH RESEARCH

Dr. Stephen Collins

The holder of this chair is Dr. Stephen Collins, Director of the Farncombe Family Digestive Health Research Institute. The support from this Chair enables Dr. Collins to direct the research of the Institute and to facilitate its operation. The Institute is focused on digestive health with a particular focus on the role of the intestinal microbiota in the maintenance of health and in the expression of diseases within and beyond the gastrointestinal tract, including the brain. Support from this chair also enables Dr. Collins to pursue his own research program that examines how the intestinal microbiota influences the gut-brain axis in the context of functional gastrointestinal disorders with or without associated psychiatric morbidity. To date, his research program has established a bi-directional interaction between the intestinal microbiota and the gut-brain axis and has demonstrated that the microbiota from patients with functional intestinal disorders have the capacity to induce dysfunction in both the gut and in the brain, and to alter behavioural profiles in ex-germ free mice colonised with microbiota from these patients. In addition, the research team has shown that selected probiotic bacteria can influence brain activity and behaviour in both mice and humans. This work will be continued with the support of the chair. It is expected that this program of research will help identify subsets of patients in whom the microbiota is relevant to the disease phenotype and to offer novel therapeutic strategies for these patients. ■

FARNCOMBE FAMILY CHAIR IN MICROBIAL ECOLOGY AND BIOINFORMATICS

Dr. Jennifer Stearns

Dr. Stearns studies how microbial colonization and succession proceed in early life and what impact the microbiome has on health outcomes and disease risk. To study these questions, she is combining basic microbiology, bioinformatics and epidemiology in close collaboration with several clinical researchers at McMaster University. Dr. Stearns is also an active contributor to microbiome research into metabolic disease, dietary interventions and women's health, in addition to establishing her research program on the infant gut microbiome. In the past year, in collaboration with the Baby&Mi study, she showed that intrapartum antibiotics given to the mother during labour decrease beneficial bacterial populations in the infant gut in the first two months of life and is now investigating how this early disturbance affects the healthy development of the gut microbiome long-term. In collaboration with the Nutrigen Study, she examined the effects of ethnicity and breastfeeding on the gut microbiome in 1-year-old children and is following up on the role of lactic acid bacteria in breaking down fibre in the solid food diet. She is actively culturing bacteria to explore these questions. In the field of microbiome research, Dr. Stearns has over 2,600 total citations, with over 300 citations per year since 2015 (H-factor of 14), and is invited to speak to both the scientific community and the public about what shapes the gut microbiome and the impact of microbes on human health. ■

FARNCOMBE FAMILY CHAIR IN PHAGE BIOLOGY

Dr. Alexander Hynes

Dr. Hynes joined the Department of Medicine as a new assistant professor in the Fall of 2017. His arrival and the creation of the Farncombe Family Chair in Phage Biology follow a renewed global interest in bacteriophages (bacteria-specific viruses) as tools to control and manipulate bacterial populations, especially in the face of the growing antimicrobial resistance crisis. As part of the Farncombe Family Digestive Health Research Institute, his primary research focus involves exploring the role bacteriophages play in the complex ecology of the gut microbiome. Dr. Hynes's experience working with phages has already yielded 4 patents and 12 first-author publications, including in *Nature Microbiology* (1), *Nature Communications* (2), and *Nature Protocols* (1). ■

FREDERICK HARGREAVE / TEVA INNOVATION CHAIR IN AIRWAY DISEASES

Dr. Parameswaran Nair

In the third year of this endowed chair, our research program has continued to grow and attract funding from governmental agencies, biotechnology and pharmaceutical industry. A major achievement has been the establishment of a Pulmonary Imaging Research Program with the support of the Robarts Institute at the University of Western Ontario. The research program has been recognized by invitations to a number of national and international scientific societies, university, and pharmaceutical industry scientific review committees. The success of the research program is reflected in funding of close to $1.5M, recruitment of four international trainees, two salary support awards from CIHR, including a Banting post-doctoral award, 22 peer-reviewed publications some in major medical journals such as the *New England Journal of Medicine*, and 52 national and international invited lectures. ■

GLAXOSMITHKLINE CHAIR IN GASTROENTEROLOGY

Dr. Stephen Collins

Dr. Collins is the director of the Farncombe Family Digestive Health Research Institute that was established 10 years ago following a generous donation from the Farncombe family. The Institute has 17 full-time faculty members including active clinicians and PhD scientists with a major focus on the role of the intestinal microbiota in the maintenance of health and in the expression of disease within and beyond the GI tract. The Institute currently holds $15.9 million in peer-reviewed funding, in addition to the $15M CIHR Strategy for Patient-Oriented Research (SPOR) grant, and supervises 67 trainees. As director, Dr. Collins administers the Institute's budget and is responsible for recruitment. This year the Institute recruited two young researchers to the department, Dr. Alex Hynes PhD, a phage biologist, and Dr. Ines Pinto-Sanchez MD, an expert on nutrition and celiac disease. Dr. Collins holds a CIHR Foundation grant for pre-clinical studies investigating the impact of the microbiota on the gut brain axis. Recent discoveries include the impact of early life stress on the microbiome and behavior in adulthood, evidence that the microbiota of patients with Irritable Bowel Syndrome (IBS) contributes to the intestinal and behavioral manifestations of this condition, and, more recently, the demonstration that a specific probiotic bacterium improves depression in IBS patients. ■

HAMILTON HOSPITALS ASSESSMENT CENTRE ENDOWED PROFESSORSHIP IN NEUROMUSCULAR DISEASE

Dr. Steven Baker

The Hamilton Hospital Assessment Centre Endowed Professorship in Neuromuscular Disease has permitted continued productivity in the Neuromuscular Clinic. Charcot-Marie-Tooth Disease (CMT) continues to be a focus. I have recently participated in an international Delphi survey addressing the topic of pediatric CMT management. This was the first collaboration to address the knowledge gap in this area of medicine. Additionally, we are examining whether a home-based series of balance exercises in CMT patients can improve both static and dynamic balance.

Chronic inflammatory demyelinating polyneuropathy (CIDP) continues to be a focus for the Peripheral Nerve Clinic. I am collaborating with Dr. Emily Mathey from the University of Sydney, Australia investigating novel antibodies that are proving to be pathogenic (i.e., NF-186, NF-155, CNTN1). I presented a talk on CIDP (Chronic Inflammatory Delaminating Paranodopathy) at the 53rd Annual Canadian Neurological Sciences Federation (CNSF) Congress. I have pone of the largest databases of seropositive CIDP cases in Canada. Dr. Adrian Opala, a fellow working under my supervision, has analyzed the effects of IVIg therapy with regards to nerve conduction studies and strength data in a cohort of CIDP patients. This work has shown that peak strength occurs after 3-6 months of treatment suggesting that Ig-based treatments may require greater persistence than initially thought.

In collaboration with Dr. Donnie Arnold, we have identified a role for rituximab in autoimmune neurological diseases that may represent pharmacoeconomic savings if such use could substitute for IVIg therapy. I am also collating a series of seropositive cases of anti-glycine receptor-associated PERM (progressive encephalomyelitis rigidity and myoclonus syndrome).

Collaborations with Dr. Stuart Phillips continue with regards to muscle metabolism and strategies to minimize sarcopenia and disuse atrophy. My goal is to explore the effects of strength training on muscle protein synthesis in patients with CMT. ■

HEART AND STROKE FOUNDATION / J. FRASER MUSTARD CHAIR IN CARDIOVASCULAR RESEARCH

Dr. Jeffrey Weitz

Dr. Weitz has held this endowed chair since 2000, with renewals granted in 2005, 2010 and 2015. With a $1 million endowment from the Heart and Stroke Foundation of Ontario and a matching amount from McMaster University, the interest from this chair has been used to support the Thrombosis and Atherosclerosis Research Program. Funds have been used to supplement the salaries of new investigators, including Drs. Paul Kim and Colin Kretz.

With this Chair, the thrombosis group has expanded over the past five years with the recruitment of Drs. Menaka Pai, Vinai Bhagirath, Paul Kim, Deborah Siegal, Colin Kretz, and Noel Chan. The increase in critical mass has expanded our research, educational and clinical capabilities. Currently, the thrombosis research group oversees research projects that span the spectrum from basic research, to translational studies that link basic science with patient-oriented research, to clinical trials, to health outcomes research, and on to knowledge translation. In addition, the group has supervised 20% of all of the MSc and PhD candidates who have received degrees under the supervision of faculty members within the Department of Medicine over the past five years. ■

HEART AND STROKE FOUNDATION / MARION W. BURKE CHAIR IN CARDIOVASCULAR DISEASE

Dr. Salim Yusuf

AREAS OF RESEARCH

1. Causes of vascular disease, diabetes and obesity
2. Global health and the role that ethnic, environmental and cultural diversity plays in the causal pathway
3. Identifying better methods of preventing and treating heart disease and stroke

ADMINISTRATIVE ROLE

1. Executive Director of the Population Health Research Institute
2. Chief Scientist – Hamilton Health Sciences

About 360 scientists, research fellows, statisticians, project managers, IT specialists, and other staff work at the PHRI. Dr. Yusuf supports and facilitates the research of several of them through the chair and a range of other funds.

HIGHLIGHTS INCLUDE:

1. Elected fellow of the Islamic World Academy of Sciences (FIAS), October 2017
2. Honorary Doctorate in Medical Sciences, Charles University, Prague, Czech Republic, January 2018
3. CADECI Career Achievement Award, February 2018
4. Knox-Hagley Memorial Lecture, Heart Foundation of Jamaica, Kingston, Jamaica, February 2018 ■

Total number of publications — 57

HEART AND STROKE FOUNDATION / MICHAEL G. DEGROOTE CHAIR IN POPULATION HEALTH RESEARCH

Dr. Sonia Anand

Dr. Anand received the Heart and Stroke Foundation / Michael G. DeGroote Chair in Population Health Research at McMaster University in 2008, and it was renewed in 2013 and 2018. The mandate of this chair is to improve research in population health as it relates to cardiovascular disease. Dr. Anand's research focuses on understanding the contribution of environmental and genetic factors on the development of cardiovascular risk factors and cardiovascular disease. She has a particular interest in conducting intersectoral research including ethnicity, sex/gender, and social factors.

The two major themes of Dr. Anand's work include:

1. Understanding the environmental and genetic causes of cardiovascular risk factors including type 2 diabetes, and cardiovascular disease among high risk groups including people of South Asian origin, Indigenous people, and women.
2. Developing and evaluating health behaviour interventions to modify risk in high risk groups.

Dr. Anand is leading the Canadian Alliance of Healthy Hearts and Minds (CAHHM) study funded by the Canadian Partnership Against Cancer and the Heart and Stroke Foundation. CAHHM recruited > 9,000 people living in Canada including the establishment of a new Indigenous cohort recruiting > 1,000 men and women from 8 First Nations communities. This study aims to understand the community and individual level determinants of chronic disease. ■

J. BRUCE DUNCAN CHAIR IN METABOLIC DISEASES

Dr. Greg Steinberg

The survival of all cells is dependent on the constant challenge to match energetic demands with nutrient availability, a task which is mediated through a highly conserved network of metabolic fuel sensors that orchestrate both cellular and whole organism energy balance. A disparity between cellular energy demand and nutrient availability is a key factor contributing to the metabolic diseases of obesity, non-alcoholic fatty liver disease, type 2 diabetes and cardiovascular disease. Dr. Steinberg's research aims to understand the fundamental mechanisms by which cells sense nutrient availability and demand, and apply this knowledge to the development of new treatments for chronic and highly prevalent metabolic diseases.

Dr. Steinberg's research into mechanisms regulating energy sensing has formed the basis for the development of several new classes of medications which are currently in clinical testing for metabolic diseases including obesity, cardiovascular disease and non-alcoholic fatty liver disease. Highlighting the significance of these

contributions in the last year, Dr. Steinberg was awarded several prominent national and international awards for diabetes and endocrinology (*American Diabetes Association Outstanding Scientific Achievement Award, Diabetes Canada Young Scientist Award, Endocrine Society Richard E. Weitzman Award*) and was named the top early career researcher in Canada (*CIHR Gold Leaf Prize for Early Career Research*).

In 2018, Dr. Steinberg was named the inaugural co-director (with Dr. Katherine Morrison, Pediatrics) of the McMaster Centre for Metabolism, Obesity and Diabetes Research. This new centre encompasses over 20 faculty members from across the university with the goal of translating world leading basic science into clinical practice to improve the diagnosis, prevention and treatment of metabolic diseases in children and adults. ■

JACK HIRSH/PHRI CHAIR IN THROMBOSIS AND ATHEROSCLEROSIS RESEARCH

Dr. John Eikelboom

Dr. Eikelboom is Associate Professor in the Department of Medicine, McMaster University, and haematologist in the thrombosis service, Hamilton General Hospital, Ontario, Canada. He originally trained in internal medicine and haematology in Perth, Australia and subsequently moved to Hamilton to take up a Tier II Canada Research Chair in cardiovascular medicine. He currently holds the Jack Hirsh/PHRI Chair in Thrombosis and Atherosclerosis Research and a Mid-Career Investigator Award from the Heart and Stroke Foundation. His research, supported by the Canadian Institutes for Health Research, the Heart and Stroke Foundation and the National Health and Medical Research Council of Australia, focuses on the efficacy and safety of antithrombotic therapies, and outcomes after bleeding in patients with cardiovascular disease. Dr. Eikelboom has published more than 550 peer-reviewed manuscripts, including first- or senior-authored papers *New England Journal of Medicine, Lancet, Journal of American Medical Association, Annals of Internal Medicine and British Medical Journal*. His h-index is 88 and his publications are cited on average 65 times each. On Google Scholar his h-index is 108 and i-10 index is >400. Since 2014 he has been listed by Thomson Reuters among the top 1% of most cited researchers in clinical medicine (http://hcr.stateofinnovation.thomsonreuters.com/). Dr. Eikelboom has presented plenary and state-of-the-art lectures at leading international conferences in North America and Europe (International Society on Thrombosis and Haemostasis, American Heart Association, American College of Cardiology, European Society of Cardiology) and has given numerous invited presentations at national and regional meetings. ■

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JACK HIRSH PROFESSORSHIP IN THROMBOSIS

Dr. Clive Kearon

Dr. Kearon's research focuses on clinical trials designed to optimize the diagnosis and treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), which are collectively referred to as venous thromboembolism (VTE).

One recently completed CIHR-funded study, and a second that is at an advanced stage of enrollment, are evaluating new ways to use D-dimer blood tests to help rule out DVT and PE, with the goal of reducing the number of ultrasound and CT pulmonary angiogram examinations that are required. Instead of using the same cut-off value to categorize D-dimer results as positive or negative, these studies are testing the safety of ruling-out thrombosis using a higher D-dimer value when clinicians decide that the clinical suspicion for thrombosis is low. A third recently completed CIHR-funded study has shown that, after a first unprovoked VTE, negative D-dimer testing identifies women with low enough a risk of recurrence to justify staying off anticoagulant therapy. However, negative testing does not justify stopping anticoagulant therapy in men, as their risk of having another thrombosis remains unacceptably high.

Dr. Kearon and the Ontario Clinical Oncology Group were responsible for study design and data management of a recently completed NIH-funded trial, published in the New England Journal of Medicine, that showed that catheter-based thrombus removal had very limited ability to prevent the "post-thrombotic syndrome" after DVT. The same network of Canadian and US investigators is now doing a trial evaluating catheter-based treatments for established post-thrombotic syndrome.

Dr. Kearon also leads an international panel that develops guidelines for the treatment of VTE and he is program director for McMaster University's Clinician Investigator Program. ■

JOHN G. KELTON CHAIR IN TRANSLATIONAL RESEARCH

Dr. Donald M. Arnold

Dr. Donald M. Arnold is the inaugural chair holder of the John G. Kelton Chair in Translational Research. He is the director of the McMaster Centre for Transfusion Research.

Dr. Arnold's team is focused on clinical and translational research in blood transfusion and hemostasis. Priority research areas include optimal utilization of blood products and novel tools to identify trends in blood product use over time. The McMaster Centre for Transfusion Research is at the forefront of large clinical datasets that can allow a vein-to-vein research platform form blood donors to blood recipients. Dr. Arnold and his research group have established collaborations in Bioinformatics and with the Ministry of Health to develop a novel blood transfusion surveillance system with clinical and research applications. Dr. Arnold is the project sponsor for the southwestern Ontario branch of the Ontario Regional Blood Coordinating Network (ORBCoN), a branch of the Ministry of Health. Ultimately, this multi-disciplinary research program will allow for more targeted transfusion therapies tailored to individual patient needs.

Dr. Arnold's research in hemostasis is focused on translational studies in immune-mediated platelet diseases. He is the lead investigator of the McMaster Immune Thrombocytopenia (ITP) Registry, the largest of its kind in Canada, which includes clinical data and a biorepository of patient samples to address basic mechanistic questions. Scientific discoveries resulting from this research have influenced guidelines and advancements in rare diseases. New diagnostic strategies, novel biomarkers and the role of cellular immunity are current areas of active research. The goal is to correlate clinical outcomes with laboratory endpoints to maximize productivity in translational medicine. Dr. Arnold's group is leading several multi-centre studies in therapeutics related to bleeding disorders, which will have direct clinical impact on patient care. Dr. Arnold's group is funded by Canadian Institutes of Health Research, Canadian Blood Services, the Ontario Ministry of Health and Health Canada. ■

JOSEPH E. DESROCHES CHAIR IN BONE MARROW TRANSPLANTATION

Dr. Irwin Walker

Dr. Irwin Walker is the inaugural chair of the Joseph E. DesRoches Chair in Bone Marrow Transplantation. This chair was instituted in 2016 to promote research in the field of Hematopoietic Cell Therapy (HCT) which includes both transplantation and other cellular based treatments. The major focus has been on chronic graft-vs-host disease (CGVHD), the commonest and most serious long-term complication of allogeneic transplantation.

Chronic graft-vs-host disease continues to be Dr. Walker's main focus of research in transplantation. A previous CIHR funded, McMaster lead, multicentre randomized controlled trial established anti-thymocyte globulin as a standard of care for GVHD prophylaxis across Canada and at many centres world-wide. Dr. Walker has been invited to speak on this topic at three of the last four meetings of the European Group for Blood and Marrow Transplantation (EBMT).

Anti-thymocyte globulin reduces chronic graft-vs-host disease by eradicating donor immune cells that would react against host tissues. Its effect however is not entirely specific and immune cells that would otherwise protect the recipient from virus infections may also be eradicated. Another method for reducing chronic graft-vs-host disease is in the administration of cyclophosphamide immediately following transplantation. Immune cells that would react against the recipient are activated during this time and in the activated form they are extremely sensitive to the killing effect of cyclophosphamide. Randomized trials of anti-thymocyte globulin and single arm studies of post-transplant cyclophosphamide show that each is effective, though it is clear that they are incompletely effective when given alone. Dr. Walker has designed a randomized trial to compare anti-thymocyte globulin, given alone, with the use of this agent together with post-transplant cyclophosphamide. This would be a multicentre randomized pilot trial which is awaiting a funding decision. ■

LEO PHARMA CHAIR IN THROMBOEMBOLISM RESEARCH

Dr. Mark Crowther

Dr. Crowther is currently chair and professor in the Department of Medicine. He also holds the positions of chair, Research Advisory Committee, the Heart and Stroke Foundation of Ontario; and chair, Scientific and Standardization Subcommittee on Control of Anticoagulation, The International Society on Thrombosis and Haemostasis. Dr. Crowther completed the Career Investigator Award Program from the Heart and Stroke Foundation of Canada in 2016 and holds the Leo Pharma Chair in Thromboembolism Research at McMaster University. His research focus is on studies designed to improve the quality of anticoagulant care and his endeavors include a wide variety of projects examining the optimal methods to prevent and treat both arterial and venous thrombosis. Working closely with a large group of collaborators, Dr. Crowther continues to lead systematic reviews and meta-analyses examining various aspects of anticoagulant care and control. His work also extends to other areas of benign hematology including evaluation of patients with immune mediated hematologic disorders. Dr. Crowther was inducted into the Royal Society of Canada in 2017. ■

MARTA AND OWEN BORIS CHAIR IN STROKE RESEARCH & CARE

Dr. Ashkan Shoamanesh

Dr. Shoamanesh's main research focus is the characterization of hemorrhage-prone cerebral small vessel disease (CSVD), namely, hypertensive arteriopathy and cerebral amyloid angiopathy, and the optimization of clinical care in this patient population. The risk-benefit analysis of antithrombotic and fibrinolytic therapy in patients who have previously suffered hemorrhagic strokes, or have underlying hemorrhage-prone CSVD is of particular interest. His personal and collaborative research in the last academic year, have shown i) improvements in the predictive ability of the Framingham Stroke Risk Profile for incident ischemic stroke through the inclusion of four circulating biomarkers, ii) a high prevalence of cerebral microbleeds in young inner city stroke patients largely in association with modifiable risk factors, iii) a higher risk for poor functional outcomes in ischemic stroke patients with microbleeds who receive thrombolytic therapy, iv) high yield clinico-radiologic diagnostic criteria for the rare inflammatory subtype of cerebral amyloid angiopathy and v) higher risk of incident dementia and mortality in community-dwelling elderly persons with microbleeds participating in the Framingham Heart Study.

Dr. Shoamanesh's ongoing work within the Secondary Prevention of Small Subcortical Strokes (SPS3) trial has demonstrated that lacunar stroke patients with cerebral microbleeds represent a more aggressive form of CSVD with higher risk of stroke recurrence and in need of efficacious therapeutic strategies. Within the Antihypertensive Treatment of Acute Cerebral Hemorrhage II (ATACH-II) trial, he has shown that contrary to concerns arising from observational studies, randomization to aggressive blood pressure lowering does not contribute to the high incidence of small remote ischemic brain lesions detected on MRI in acute intracerebral hemorrhage patients. Moreover, his novel observations in a number of trial participants suggest that at least a fraction of these hyperintense and restricted lesions visualized on diffusion-weighted imaging, are subacute microhemorrhages captured in evolution, rather than ischemic in nature.

He currently serves as principal investigator of the Non-Vitamin K Antagonist Oral Anticoagulants for Stroke Prevention in Patients with Atrial Fibrillation and Previous Intracerebral Hemorrhage (NASPAF-ICH) randomized controlled trial assessing optimal antithrombotic therapy in patients with atrial fibrillation and previous intracerebral hemorrhage at recruitment sites across Canada and is founding co-principal investigator of the Canadian HEmorrhagic Stroke trIals initiatiVE (CoHESIVE); a Canada-wide multidisciplinary network of collaborators devoted to the development, and successful and efficient execution of hemorrhagic stroke trials. He is the publications committee coordinator of the Rivaroxaban Versus Aspirin in Secondary Prevention of Stroke and Prevention of Systemic Embolism in Patients with Recent Embolic Stroke of Undetermined Source (NAVIGATE ESUS) trial, and adjudication committee co-chair of the INVestIgation of rheumatiC AF Treatment Using Vitamin K Antagonists, Rivaroxaban or Aspirin, Studies (INVICTUS).

In 2018, he was awarded an additional CAD $1,109,006 of operational research funding as principal investigator or co-investigator from multiple peer-reviewed grants (4; 2 from the Canadian Institutes of Health Research [CIHR]). ■

MCMASTER UNIVERSITY / GLAXOSMITHKLINE CHAIR IN LUNG IMMUNOLOGY AT ST. JOSEPH'S HEALTHCARE

Dr. Mark Larché

Dr. Mark Larché was appointed to the McMaster University/GSK Chair in Lung Immunology at St. Joseph's Healthcare in March 2008. This chair was renewed in 2013 for a further 5-year term. Funding in 2017-2018 to support research activities associated with this chair comes from CIHR, the National Institutes of Health (USA), and Adiga Life Sciences Inc. Active areas of research within the laboratory are:

1. the role of T lymphocytes in the pathogenesis of asthma/allergic airways disease (together with Dr. Gail Gauvreau, Dr. Paul O'Byrne, Dr. Helen Neighbour and Dr. Mark Inman, NIH);

2. mechanisms of peptide-induced immune tolerance (with Dr. Elena Tonti, NIH, Adiga Life Sciences);

3. the pathogenesis and treatment of scleroderma (systemic sclerosis, with the Hamilton Scleroderma Group);

4. development of peptide immunotherapy for peanut allergy (together with Dr. Manel Jordana, Elizabeth Simms and Dr. Susan Waserman; Aravax Pty Australia);

5. pathogenesis and treatment of rheumatoid arthritis (with Dr. Maggie Larché, Dr. Derek Haaland & Dr. Elena Tonti; CIHR, Adiga Life Sciences);

6. the role of complement proteins in the pathogenesis of pulmonary fibrosis in graft versus host disease. Collaborative projects are currently underway with other faculty at McMaster University and St. Joseph's Healthcare within the Firestone Institute for Respiratory Health, the Division of Nephrology, the Division of Hematology & Thromboembolism, the McMaster Immunology Research Centre within the Department of Pathology & Molecular Medicine, and the Department of Chemical Engineering at McMaster University. ■

MICHAEL G. DEGROOTE CHAIR IN INFECTIOUS DISEASES

Dr. Mark Loeb

Dr. Loeb has completed the second year of a cluster randomized controlled trial to assess whether adjuvanted influenza vaccine in children leads to greater herd immunity. The trial is being conducted in a unique setting, Hutterite colonies in Alberta and Saskatchewan. Dr. Loeb is also using serological data from this community collected over the past 10 years to better understand how initial infection in childhood can dictate future response to influenza vaccination ("Original Antigenic Sin). Genotyping of the first genome wide association study (GWAS) to assess the genetic predisposition to polio survivors from the 1950s and 1960's was completed, this was an international study conducted with collaboration from the March of Dimes. Dr. Loeb completed a large randomized trial to assess if vitamin D reduces respiratory infection in children in Vietnam. Dr. Loeb is the principal investigator of a trial funded by Joint Global Health Trials competition of UK MRC Wellcome Trust to assess whether inactivated vaccine can reduce adverse vascular events. This is an international trial being conducted in 10 countries involving collaboration from colleagues at PHRI. There have been about 5,000 participants enrolled in this study. Dr. Loeb received contracts from WHO to develop a list of antibiotics for the essential list of medicines and to develop algorithms to improve antibiotic use in low- and middle-income countries. Dr. Loeb completed a four-year randomized trial of probiotics to reduce respiratory infections in residents of long-term care facilities. The analyses for a dengue genetic epidemiology study were finalized. ■

MICHAEL G. DEGROOTE CHAIR IN STROKE PREVENTION

Dr. Mukul Sharma

Dr. Sharma's research focus remains on stroke prevention in the subacute phase of stroke and TIA and the prevention of covert infarcts – imaging defined infarcts which are not recognized acutely due to subtle or non-acute deficits. These infarcts are more common than clinically recognized stroke and associated with cognitive, motor and possibly psychiatric manifestations. COMPASS MIND, a large MRI sub-study has now been completed and the effect of Rivaroxaban with or without aspirin on covert infarcts, cognition and function. COMPASS MIND studies in a stroke-free population, while NAVIGATE MIND recruits a population soon after stroke. NAVIGATE MIND has completed acquiring images and analysis is underway with presentation of the results in the next few months. In acute stroke prevention, DATAS II is complete and has been presented. This trial demonstrated the safety and feasibility of the use of novel oral anticoagulants in early secondary prevention which opens the door to explore these agents in this phase of stroke. A new trial to explore the potential of novel anticoagulants in stroke prevention is about to begin with the potential to improve outcomes in those most at risk for stroke recurrence. Dr. Sharma continues to serve as the chair of the Canadian Stroke Consortium and will be the co-chair of the World Stroke Congress in October 2018, in addition to speaking committments. ■

MICHAEL G. DEGROOTE PROFESSORSHIP IN STROKE MANAGEMENT

Dr. Demetrios (James) Sahlas

Dr. Sahlas has continued to promote inter-professional collaboration with respect to quality improvement research in the management of stroke. He is presently working with an independent start-up company on the development of a secure online platform for use by paramedic services to monitor the efficiency of patient access to hospital stroke care from symptom onset, share pertinent patient information in advance of the patient's arrival, and to reduce the overall symptom onset-to-needle time by augmenting communication between healthcare providers.

The stroke research group based at the Hamilton General Hospital has continued to expand in order to coordinate an increasing level of clinical trial activity. Dr. Sahlas and his colleagues are presently recruiting into several multicenter trials, involving a growing team of research coordinators and nurses. Platforms include acute stroke trials, stroke prevention trials, and vascular cognitive impairment trials. In addition, he has provided mentorship to many of the postgraduate neurology trainees and stroke fellows who have presented their work at several international conferences. ■

MORAN CAMPBELL CHAIR IN RESPIRATORY MEDICINE

Dr. Martin Kolb

Dr. Martin Kolb's major research area is focused on mechanisms of lung injury, repair and fibrosis, particularly in Idiopathic Pulmonary Fibrosis (IPF). He has a strong interest in growth factor biology (e.g. TGFβ and IL-1), extracellular matrix, and mesenchymal cell progenitors (mesenchymal stem cells and fibrocytes). In his lab he uses a variety of animal models to study disease mechanisms and also the efficacy of novel drugs in the preclinical setting. Further, Dr. Kolb leads activities in biomarker development for lung fibrosis and he participates as principal investigator and steering committee members in numerous clinical trials on interstitial lung disease. Dr. Kolb has over 140 peer-reviewed publications in journals such as *New England Journal of Medicine, Journal of Clinical Investigation, American Journal of Pathology, American Journal of Respiratory and Critical Care Medicine, Journal of Immunology, European Respiratory Journal* and many others. He is/was funded by CIHR, NIH, CFI, OTS and different Pharmaceutical companies over the years. He has received career awards from the Parker B. Francis Families Foundation, the Department of Medicine at McMaster, and the New Investigator Award from the Canadian Institute for Health Research.

Dr. Kolb is very active in scientific publications. He was deputy editor for *Respirology*, the official journal of the Asian Pacific Society for Respirology between 2008-2017 and associate editor for *Thorax*, journal of the British Thoracic Society from 2015-2017. In January 2018, he was appointed as chief editor for the *European Respiratory Journal*, ranked number 3 amongst more than 50 specialty journals in respiratory medicine globally. This was the first time that European Respiratory Society has appointed a chief who is based outside of Europe. ■

POPULATION HEALTH RESEARCH INSTITUTE CHAIR IN CARDIOLOGY RESEARCH

Dr. Jeff Healey

Dr. Healey is a professor in the Department of Medicine at McMaster University, and is an associate faculty in the Department of Health Research Methods, Evidence and Impact. He is the director of arrhythmia services at Hamilton Health Sciences, and is a senior scientist at the Population Health Research Institute, where he holds the Chair in Cardiology Research. Dr. Healey is the principal investigator and chair of the Canadian Stroke Prevention Intervention Network (CSPIN), which is conducting a series of clinical trials related to atrial fibrillation and stroke prevention and will support the development of new Canadian researchers in this field. He is the past co-chair of the Canadian Cardiovascular Society's Atrial Fibrillation Guidelines Committee and past chair of the Cardiac Care Network of Ontario's Heart Rhythm Working group.

Dr. Healey was the lead author of the ASSERT trial, which was published in the *New England Journal of Medicine* in 2012 and demonstrated the increased stroke risk associated with sub-clinical atrial fibrillation detected by pacemakers. He went on to demonstrate that study sub-clinical atrial fibrillation in present in over a third of older individuals with cardiovascular conditions, but without pacemakers, and published the results in *Circulation* in 2017. Dr. Healey now leads the 4000-patient ARTESiA trial, which will determine if treatment with direct anticoagulants can prevent stroke in patients with sub-clinical atrial fibrillation. Dr. Healey is also studying the worldwide variation in patient outcomes related to atrial fibrillation in a 15,000-patient cohort study, and published the main outcomes of this study in the *Lancet* in 2016.

Dr. Healey also continues to study outcomes for patients receiving implantable defibrillators, specifically to find ways to reduce the morbidity associated with these lifesaving devices. He was the lead author of the SIMPLE trial, published in the *Lancet* in 2015, which demonstrated that implantable defibrillators could be safely inserted without performing intra-operative defibrillation testing. He is currently leading the ATLAS trial comparing a new, totally sub-cutaneous defibrillator against the traditional defibrillator which requires a lead to be placed through a vein and into the heart.

In his role as Chair in Cardiology Research, Dr. Healey supervises students in the Health Research Methodology Program, and mentors several young researchers starting programs in the field of cardiac arrhythmia. Dr. Jorge Wong has recently published an analysis from ASSERT, demonstrating that progression to longer episodes of subclinical atrial fibrillation is strongly associated with the development of heart failure. Along with Dr. Healey, Dr. Wong has set up a series of studies to determine how implantable devices can be used to prevent this common adverse outcome in patients with pacemakers and implanted defibrillators Dr. William McIntyre is completing his PhD and with the mentorship of Drs. Healey and Connolly, has established a program to study the significance of subclinical atrial fibrillation detected at the time of hospitalization for non-cardiac surgery or severe medical illness. ■

POPULATION HEALTH INSTITUTE CHAIR IN DIABETES RESEARCH AND CARE

Dr. Hertzel Gerstein

This chair was established in 2001 to provide broad support for research activities focused on the prevention and treatment of dysglycemia and its serious consequences. Dr. Gerstein is pursuing these goals through a broad range of research-related activities at the international, national and local levels. These activities include:

a) an international PI and leader of the 10,000 person REWIND trial of a GLP-1 analog on serious health outcomes in people with diabetes;

b) proteomic and genomic analyses of 8000 participants followed for up to 8 years in the ORIGIN trial that is identifying novel mechanisms, causes and risk factors for cardiovascular and other serious health outcomes in people with dysglycemia, and that has identified a novel biomarker for metformin's action;

c) ongoing analyses of epidemiologic and genetic data from the NIH-funded 10,000 person ACCORD study of the short and long-term role of glucose, blood pressure and lipid management in people with type 2 diabetes;

d) epidemiologic and ancillary analyses of data collected in a variety of these and other completed global trials and epidemiologic studies addressing various aspects of dysglycemia; and

e) conceptualization and chair of four trials of novel approaches to inducing a diabetes remission. In addition to these clinical research activities, he continues to collaborate with colleagues at McMaster in research using animal and cellular models of dysglycemia to identify the mechanisms underlying the development of diabetes, and the relationship between dysglycemia and cardiovascular diseases, mortality, cognitive decline, and cancers. Dr. Gerstein's research is currently funded by peer-review agencies and industry, and is conducted through the Population Health Research Institute, where he is deputy director.

During the 2017-2018 academic year, Dr. Gerstein published more than 20 articles and editorials in major peer-reviewed journals, and presented data and perspectives as an invited guest speaker, commentator or faculty member at 21 national and international scientific meetings. He was also the 2017 Hamilton Negev Dinner Gala Honouree for outstanding medical achievement. Based on his contributions from 2008-2018, ExpertScape ranks Dr. Gerstein in the top 0.011% of all diabetes experts in the world (expertscape.com/ex/diabetes+mellitus). ■

RICHARD HUNT / ASTRAZENECA CHAIR IN GASTROENTEROLOGY

Dr. Premysl Bercik

Gut microbiota has been recognized as a major player in health and disease, affecting function of many organs, including the central nervous system. Dr. Bercik has a long-standing interest in the microbiota-gut-brain axis, a bidirectional communication between the digestive system and the brain, and its role in chronic gastrointestinal diseases.

His research in animal models has shown that gut microbiota determines behavior and brain chemistry of the host, plays a key role in abnormal behavior observed in models of early life stress, and that many aspects of gut dysfunction seen in patients with Irritable Bowel Syndrome (IBS), as well as comorbid anxiety, can be transferred into germ-free mice by microbiota transplantation. Dr. Bercik's research is highly translational, providing proof of concept studies, from bench to bedside. Work in his lab demonstrated that the probiotic bacterium *Bifidobacterium longum NCC3001*, that normalized anxiety-like behavior and brain neurotrophin levels in animal models, also improves depression and alters brain activity patterns in patients with IBS. His research is supported by the Canadian Institutes for Health Research Foundation and the National Institutes of Health (USA) grants. Additional recent funding from the W. Garfield Weston Foundation and the Canadian Digestive Health Foundation/Society for Study of Celiac Disease allows to study basic mechanisms of the microbiota-host cross talk and to investigate the role that different wheat proteins play in symptom generation in IBS patients, respectively. He is also co-principal investigator of a large patient-oriented CIHR SPOR grant investigating the role of gut microbiota in patients with chronic gastrointestinal illnesses, including Inflammatory Bowel Disease and IBS. For his research achievements, Dr. Bercik was awarded the 2018 Canadian Association of Gastroenterology Visiting Professor Award.

Dr. Bercik's clinical interest lies in functional bowel disorders, such as IBS, gastrointestinal motility and celiac disease. ■

SALIM YUSUF CHAIR IN CARDIOLOGY

Dr. P.J. Devereaux

Established in 2006, the goal of the Salim Yusuf Chair in Cardiology is to contribute significantly to the body of scholarship in the area of cardiology.

Dr. Devereaux's research career continues to focus on informing the epidemiology, risk assessment, prevention, and management of major perioperative vascular complications. The primary goal of his research program is to save lives of patients undergoing surgery and ensure surgery is safe so that anyone can obtain the benefits of surgery without suffering a major complication.

Clinically, over the past year, he has been working on restructuring of outpatient cardiology clinics. He also led the recruitment of two bright cardiologists to their group, Drs. Natalia Pinilla and Gabe Acosta. He also established a leadership policy for the Division of Cardiology, and through the policy process, site leaders for St. Joseph's Health Care Centre and the Juravinski Hospital and Cancer Centre (i.e., Drs. Vikas Tandon and David Conen) were appointed.

The Division of Cardiology provided funding for two Fellowships to provide partial funding for an individual who is part of the trainee program in Cardiology. The division also funded three innovation grants to allow a division member to propose an idea related to innovation in clinical care, education, research, or administration. ■

ST. PETER'S / MCMASTER CHAIR IN AGING

Dr. Sharon Marr

Navigating our complex health care system can be challenging for our older adults and their caregivers. To improve access, equity, and promote a continuum of evidence-based care, the chair has been working to provide better integrated and coordinated service to our growing older adult population with diverse and complex needs. The chair, partnering and collaborating with other researchers and educators, will remain committed to providing and supporting care, education and research that focuses on the "voice of older adults" to understand and listen to each of their stories. The chair will continue to focus on programs that empower older adults and programs that enhance the knowledge and skills of care providers and health care professionals in the community and underserviced areas across Canada and internationally.

The chair has proudly continued to support the Geriatric Certificate Program (GCP), an interprofessional educational program, and its expansion with e-learning modules. With close to 800 clinicians registered across Canada and abroad, and approximately 250 graduates, the chair and the GCP educational leaders will promote its evidence-based educational programs to health care professionals with a focus on non-regulated health care professionals and communities outside of our region over the next year. Over the past year, the GCP has had over 28,000 visitors actively engaged within its website not only across Canada but also internationally. In the upcoming year, GCP will have its first international student graduate from its program. Dr. Emil Josef Almazan, MD, from the Philippines, will be travelling to Canada in January 2019 to complete his final in person course.

The chair has continued to promote and support many educational programs such as the Annual Geriatric Education day. In 2017 Dr. Ron Schlegel, Founder and Chairman of Schlegel Villages Inc. and Schlegel-UW Research Institute for Aging (RIA), was the recipient of the Department of Medicine Division of Geriatric Medicine Life Long Achievement Award. Dr. Schlegel was unable to attend the award ceremony last year. However, he was able to receive and be recognized for his achievements at this year's sold out 8th Annual Geriatric Education Day, "Health Promotion in our Aging Population". The chair has supported research activities of GERAS scientists Dr. Courtney Kennedy and George Ioannidis, and Geriatric Medicine Clinical Scholars Dr. Judith Seary and Dr. Mona Sidhu. The chair has also helped to support Post doc, Dr. Sarah Sztramko's research on the impact of technology education on socialization and empowerment of older adults.

ACKNOWLEDGEMENT:

It has truly been an honour and privilege for the chair to be supported and mentored by the following: St. Peter's Hospital Foundation/Hamilton Health Sciences; McMaster University Faculty of Health Sciences, Dr. Paul O'Byrne, Dr. Mark Crowther and the Department of Medicine Administration staff; Dr. John Kelton, Division of Geriatric Medicine; Mr. Kevin Sulewski; Estate of Lindsay Thompson; Ms. Sharon Pierson; Dr. Alexandra Papaioannou; Mr. Ryan Liddell; Ms. Lynn Pacheco; Ms. Lily Consoli; Ms. Kristy McKibbon and Ms. Jane McKinnon-Wilson. ■

WILLIAM J. WALSH CHAIR IN MEDICAL EDUCATION

Dr. Ameen Patel

Dr. Patel has held this esteemed chair since 2013. The chair provides salary support for the associate chair, education to facilitate the promotion and integration of teaching and education scholarship into the undergraduate and postgraduate programs. The support of the chair also facilitates Dr. Patel's contribution to teaching, clinical and education scholarship and research.

The support the chair has been invaluable in allowing Dr. Patel to make significant education contributions, promote and mentor colleagues to achieve their education goals and promote the Department and University. It is a privilege to hold this chair and Dr. Patel is immensely grateful and appreciative of the generous support from Mr. Gary D. DeGroote and Mr. Michael H. DeGroote.

Dr. Patel is the deputy GIM division director, postgraduate PGY4 internal medicine program lead, director of international electives and the Department of Medicine associate chair, education. He is a member of the Council of the Canadian Society of Internal Medicine and a member of its education and membership subcommittees. Dr. Patel is also a long-standing member of the Royal College Internal Medicine Examination Board.

One of the mandates of the holder of the William J. Walsh Chair in Medical Education is to promote continuing education. Dr. Patel is a certified Maintenance of Certification Accreditor for the Canadian Society of Internal Medicine. In this role, he reviews continuing education events to ensure they meet all the Royal College of Physicians and Surgeons of Canada requirements including appropriate learning goals and objectives. He is a long-standing member of the Planning Committee for the Annual McMaster University Review Course in Internal Medicine. Two years ago, Dr. Patel collaborated with a number of colleagues from McMaster and other institutions nationally and internationally to initiate the Perioperative Care Congress. This continuing education event has held two successful annual events that have brought together leaders in perioperative medicine from anesthesia, surgery, medicine, nursing and allied health. The congress is unique in bringing all these disciplines together to promote collaborative research and care in a growing field of healthcare. Dr. Patel served for a number of years as the liaison between the Canadian Society of Internal Medicine and the Canadian Journal of General Internal Medicine. He has now taken on a role as the Deputy Editor for the journal. The journal is the official publication of the Canadian Society of Internal Medicine, the largest national specialty society, and aims to provide a forum for physicians to publish original research, systematic reviews and manuscripts on teaching and learning the art and science of medicine and humanities in literature in medicine.

Dr. Patel contributes a significant amount of time to clinical teaching at all levels in medicine and its subspecialties. His healthcare delivery includes patient care and clinical teaching on the Clinical Teaching Unit, the chief medical resident and Medical Optimization Clinics and in the Emergency Department. In the past year,

he has contributed to the creation of an administrative structure for the implementation of competency by design. Dr. Patel has also provided mentorship and feedback on the development of new evaluation tools. He has shepherded the promotion of direct observation and immediate feedback and advocated for learners to be proactive in their request for faculty observation.

In the 2017/2018 academic year, Dr. Patel was invited to join a committee reviewing the Royal College of Physicians and Surgeons of Ireland medical school curriculum. This international committee also included members from the US and the UK. A comprehensive report was submitted to the Royal College of Physicians and Surgeons in Ireland and Dr. Patel will continue to consult on the implementation and evaluation of the new curriculum. As part of this review process, he organized a meeting at McMaster between education leaders from the Royal College of Surgeons in Ireland and McMaster allowing for collaboration between the two institutions, which are both implementing significant curriculum changes. This invitation builds on a clinical and research collaborative Dr. Patel has established between these two institutions. Each summer, these two institutions have an exchange of 10 medical students completing clinical electives in Dublin, Ireland and Hamilton, Ontario. More recently, this collaboration has expanded to include two to three-month research electives for Canadians studying in Ireland.

Dr. Patel had five peer-reviewed publications. Since being awarded the chair, he has had 24 peer-reviewed publications.

In the 2018/2019 academic year, Dr. Patel's overall healthcare delivery, administration, education, research and leadership contributions will continue unchanged. At the request of Dr. Mark Crowther, Dr. Patel will serve as the acting division director for a new division, the Division of Innovation and Education. ■

WILLIAM J. WALSH CHAIR IN MEDICINE

Dr. Judah Denburg

Dr. Denburg continues to actively contribute to clinical, educational and research endeavours in academic internal medicine. He attends one of the largest and most intensive specialist academic internal medicine practices in Canada. Specializing in immune aspects of disease affecting many organ systems, Dr. Denburg sees patients, most with complex medical problems, through his referral-based outpatient and inpatient consultations. He also continues his involvement in clinical trials studying these disorders.

Dr. Denburg's primary research thrust examines the mechanisms of allergic inflammation, with particular emphasis on hemopoietic cytokines and their role in activating the differentiation and recruitment of inflammatory cells such as eosinophils, basophils and mast cells. This inquiry includes an exploration of the growth and differentiation of human basophil and eosinophil precursors, with the development of in vitro assays to monitor clinically relevant fluctuations in these cells during allergic responses in allergic rhinitis, nasal polyposis and asthma. His research has established the biological importance of hemopoietic mechanisms in allergic inflammation and emphasizes important, now globally-recognized, links among rhinitis, asthma and other allergic disease manifestations ("allergy as a systemic disease"). Findings have been published in high-impact journals, and are the subject of ongoing peer-reviewed and industrial grants.

As founder, scientific director and CEO of AllerGen NCE Inc. for the past 13 years, Dr. Denburg has forged a strong national research and training community in allergic disease, uniting academics, researchers and students from 47 disciplines and 28 affiliated Network universities and hospitals in multi-sectoral partnered teams, now with international connections and visibility in several continents. The William J. Walsh Chair has been a critically important asset in support of Dr. Denburg's role in developing and maintaining AllerGen's activities. For a summary of AllerGen's major accomplishments over the past year, see the report included in this publication. ■

Reports: Canada Research Chairs

CANADA RESEARCH CHAIR IN ALLERGY AND IMMUNE TOLERANCE

Dr. Mark Larché

Dr. Larché was appointed Canada Research Chair in Allergy and Immune Tolerance in September 2006. This chair was renewed in 2013 for a further seven years. Dr. Larché's group is based at both McMaster University Medical Centre and St. Joseph's Healthcare. For the 2017-2018 period, the group consisted of approximately 20 researchers including postdoctoral fellows, project managers, technicians, graduate students, undergraduate co-op/thesis students, clinical study coordinators and five associated faculty members. The laboratory continues to investigate the pathogenesis and treatment of a variety of chronic inflammatory diseases including allergic rhinitis and asthma (NIH, CIHR, Adiga Life Sciences Inc), peanut allergy (Aravax Pty), rheumatoid arthritis (CIHR, Adiga Life Sciences Inc), scleroderma (Hamilton Scleroderma Group), the role of complement proteins in transplant rejection (graft versus host disease), and autoimmune thrombocytopenia. Funding has come from CIHR, the National Institutes of Health (USA), Aravax Pty (Australia) and Adiga Life Sciences Inc. Dr. Larché continued to develop and evaluate peptide therapies for allergic disease in close collaboration with Aravax Pty (Australia), and Adiga Life Sciences, a joint venture between McMaster and UK-based Circassia Pharmaceuticals PLC. The results of continuing mechanistic studies performed in collaboration with colleagues at UBC and Queen's University will inform design of future interventions and may identify biomarkers of efficacy. Dr. Larché's group continues active collaborations internationally (Australia, Sweden, UK, USA, Canada) and with other researchers based at McMaster University and St. Joseph's Healthcare including members of the Department of Biochemistry & Biomedical Science, the Department of Pathology & Molecular Medicine, the Department of Medicine (Divisions of Clinical Immunology & Allergy, Rheumatology, Nephrology, Respirology and Hematology & Thromboembolism), and the Department of Chemical Engineering. ■

8 Canada Research Chairs

CANADA RESEARCH CHAIR IN ETHNIC DIVERSITY AND CARDIOVASCULAR DISEASE

Dr. Sonia Anand

In April 2011, Dr. Anand received the Canada Research Chair in Ethnic Diversity and Cardiovascular Disease. This CRC was renewed in 2018. The goal of the chair includes:

1. Identifying health behaviours (dietary and activity) and genetic determinants of abdominal obesity in related cardiometabolic risk factors in adults of diverse ethnic origin,
2. Evaluating interventions aimed at lowering CV and diabetes risk in high risk ethnic groups.
3. Investigating the impact of the *in utero* environment, maternal fetal-genetics and epigenetics together with early life behaviours on the development of cardiometabolic traits among South Asian and Aboriginal people.

In 2013, Dr. Anand and her colleagues received a grant from CIHR Institute of Nutrition, Metabolism and Diabetes aimed at understanding the early origins of chronic diseases by studying the nutritional, genetic, epigenetic, and microbiome associations with cardio-metabolic phenotypes and allergic disorders among 5,500 newborns from the CHILD, FAMILY, START and ABC birth cohort studies. In 2016 they received funding from CIHR to continue this DoHAD research with a Team Grant focused on dietary intake and metabolomics in early life and pregnancy.

Key Recent Publications reflecting this work include:

1. **Anand SS**, Gupta M, Teo KK, Schulze K, Desai D, Abdalla N, *Zulyniak M, de Souza R, *Wahi G, Shaikh M, Beyene J, deVilla E, Morrison K, McDonald S, Gerstein H, South Asian Birth Cohort (START) – Canada Investigators. Causes and Consequences of Gestational Diabetes in South Asians living in Canada: results from a prospective cohort study. *CMAJ* Open 2017 Aug 9;5(3):E604-E611

2. Zulyniak MA, de Souza R, Shaikh M, Desai D, Lefebvre DL, Gupta MK, Wilson J, *Wahi G, Subbarao P, Becker AB, Mandhane PJ, Turvey SE, Beyene J, Atkinson SA, Morrison KM, McDonald SD, Teo K, Sears MR, **Anand SS**. Does the impact of a plant-based diet during pregnancy on Birth weight differ by ethnicity? A dietary pattern analysis from a prospective Canadian Birth cohort alliance. *BMJ Open*. 2017 Nov 14;7(11) ■

CANADA RESEARCH CHAIR IN INFLAMMATION, MICROBIOTA AND NUTRITION

Dr. Elena F. Verdú

Dr. Verdu's CRC program explores the mechanisms underlying gluten-related disorders, including celiac disease and non-celiac wheat sensitivity, and investigates the potential role of intestinal microbes as modifier of disease risk.

During 2017-18, Dr. Verdu has published 13 peer-reviewed papers (9 original papers, including one meta-analysis, and 4 reviews) in top journals of her field (*Gastroenterology*, IF:18,18) as well as in general journals (*Science*, IF: 37.2; *Nature*, 41,57; *Nat Immunol*, 21,8; *Science Reports*, IF:5.2). Expanding on the discovery that opportunistic pathogens and commensals in the small intestine metabolize gluten differently, work was initiated in Dr. Verdu's lab to exploit the microbiota metabolic capacity to either promote dietary gluten detoxification or, microbial (serpin) inhibition of proinflammatory bacterial elastase. A molecular mechanism through which bacterial elastase can stimulate innate immunity, and that requires PAR-2 signaling in the small intestine was described. The results bear profound implications to the pathogenesis of celiac disease as they would provide a second signal, independent of gluten exposure, for the worsening of gluten-induced pathology in genetically predisposed hosts. This work is currently under revision in *Nature Communications* and *Gastroenterology*.

In the past year, Dr. Verdu has been invited to present key note addresses at the (1) International Celiac Disease Symposium, New York, USA, (2) Spanish Association of Prebiotics and Probiotics, (3) Prolamin Group Meeting, Minden, Germany and (4) Master's Series in Gastroenterology, University of Buenos Aires. She is the president of the Association for the Study of Celiac Disease (www.nasscd.org) and recently received the Canadian Gastroenterology Association "Education Excellence Award". She continues to be funded by CIHR, CCC and by a combined CIHR/French National Research Institutes grant in addition to industry grants by Biocodex (France), Nestle Research Center (Switzerland) and Enterome (France). ■

CANADA RESEARCH CHAIR IN INTERDISCIPLINARY MICROBIOME RESEARCH

Dr. Michael Surette

The human microbiome, the collection of microbes that live on and in the human body, are now widely recognized as contributing to almost all aspects of human biology. Dr. Surette has established a broad and highly collaborative research program addressing the mechanisms by which the microbiota contribute to human health and disease. Specific projects investigate cystic fibrosis respiratory infections, asthma, pneumonia, sepsis, ulcerative colitis, irritable bowel syndrome, metabolic syndrome, and the development of the microbiome in infants, and changes that occur in the elderly. His lab has expertise on developing culture-independent and culture-based approaches to characterize and exploit the microbiome. The ability to culture the human microbiome is driving new research into bioprospecting the human microbiota's natural product diversity for bacteria/bacterial products with therapeutic applications. This new direction of research has expanded through a Genome Canada GAPP grant between the Surette lab and Adapsyn (a McMaster-based start-up).

During the reporting period, the Surette lab contributed 14 peer reviewed publications and he gave 14 invited presentations. In 2018 he was elected as a Fellow of the American Academy of Microbiology and was the Canadian Society of Clinical Chemists Travelling Lecturer for 2018. His research is supported by operating grants from Genome Canada, Canadian Institutes of Health Research, Cystic Fibrosis Canada and Crohn's and Colitis Canada, and is a co-applicant on several team grants. His lab is also coordinating the microbiome studies for the IMAGINE SPOR network. In addition to his research program, Dr. Surette is co-director of McMaster's Farncombe Metagenomic Facility. ■

Number of papers submitted by the Surette lab during the reporting period

14

CANADA RESEARCH CHAIR IN METABOLISM, OBESITY AND TYPE 2 DIABETES

Dr. Gregory Steinberg

This Tier 2 Canada Research Chair was initiated in 2008 when Dr. Steinberg returned to Canada from Melbourne, Australia. Since this time, Dr. Steinberg has published 130 manuscripts in leading peer-reviewed journals such as *Nature Medicine, Cell Metabolism* and *Diabetes*. Importantly, the results of these publications have now formed the basis for several new classes of medications which are currently in clinical trials for obesity, type 2 diabetes, cardiovascular disease and non-alcoholic fatty liver disease.

Highlighting the significance of his contributions, in the last year Dr. Steinberg was awarded several prominent national and international awards for diabetes and endocrinology (*American Diabetes Association Outstanding Scientific Achievement Award, Diabetes Canada Young Scientist Award, Endocrine Society Richard E. Weitzman Award*) and was named the top early career researcher in Canada (*CIHR Gold Leaf Prize for Early Career Research*).

In addition to his research, Dr. Steinberg has also been heavily involved with education and has been the primary supervisor for 14 postdoctoral fellows, 12 PhD, 12 MSc and 12 BSc students and has sat on over 30 graduate student committees. Many of these trainees now have faculty or senior research positions in academia and industry.

In 2018, Dr. Steinberg was named the inaugural co-director (with Dr. Katherine Morrison, Pediatrics) of the McMaster Centre for Metabolism, Obesity and Diabetes Research. This new centre encompasses over 20 faculty members from across the university with the goal of translating world leading basic science into clinical practice to improve the diagnosis, prevention and treatment of metabolic diseases in children and adults. ■

CANADA RESEARCH CHAIR OF RESEARCH TRANSFER IN INTENSIVE CARE

Dr. Deborah Cook

Emerging studies show that the human microbiome is deranged by critical illness, exacerbated by the ubiquitous acid suppression and antimicrobials in the ICU. Microbiome modification with the goal of improving health has been identified as an important field of study for patients on life support. One postulated mechanism to this end is probiotic administration. Probiotics are defined by the WHO as 'microorganisms which when ingested confer health benefits to the host'. In collaboration with the Canadian Critical Care Trials Group, I have been leading a multicenter randomized trial testing the probiotic Lactobacillus rhamnosus GG, testing the effect on infections such as pneumonia and Clostridium difficile, diarrhea and antimicrobial use in the ICU. This low cost 'natural health food product' appears promising in trials of children and adults in the out-patient setting and in some healthcare institutions. In the ICU, based on small trials at risk of bias, some guidelines suggest that probiotics be used today as a cost-effective way to prevent pneumonia. However, before the knowledge available to date is prematurely encoded into practice, our community is responsibly and rigorously evaluating probiotics in critical illness in 30 centres around the world, led by colleagues at St Joseph's Hospital (Drs. Erick Duan, Mark Soth and myself), the Hamilton General Hospital (Dr. Maureen Meade) and the Juravinski Hospital (Drs. Tim Karachi and Bram Rochwerg).

Critical illness requiring life support raises common existential questions about meaning, purpose, relationships and destiny; however, the austere ICU setting is not usually considered an ideal venue for expressions of spirituality. With the globalization of society, the world grows increasingly spiritually and culturally diverse. The WHO identifies spirituality as 'a core dimension of health', potentially sustaining people in times of distress. Spiritual support is one of seven end-of-life care quality domains. Professional policy statements consider identifying (but not necessarily addressing) spiritual needs to be a core ICU competency. Families, however, report that ICU practitioners, especially physicians, are inadequate in this aspect of their practice, especially for dying patients. At St. Joseph's Healthcare Hamilton, bedside nurses, other clinicians, the intensivist team (Drs. Jill Rudkowski, Waleed Alhazzani, Roman Jaeschke, Tania Ligori, Eric Duan, Mark Soth and myself) and our palliative care colleagues (Drs. Anne Boyle and Anne Woods) have expanded our 3 Wishes Program for dying patients. Bedside practitioners and the 3 Wishes team elicit and implement wishes from the patient when possible as well as their families and other clinicians — to dignify the patient's death, honour and celebrate the patient's life, and foster humanism in practice. Interviews with over 200 family members and clinicians illustrate how spirituality is considered an integral part of a life narrative before, during, and after a death. Eliciting wishes stimulates conversations about responding to death in personally meaningful ways, facilitating continuity and closure, and easing emotional trauma. Soliciting wishes identifies positive aspirations which provide comfort in the face of death. Wishes may be grounded in spiritual goals such as peace, comfort, connection and

reconnection - the latter being a poignant wish of persons separated by distance or discord. Frequent secular wishes are for a spiritually-enhanced environment. Others are for religious rituals. Soliciting wishes can help to revive lapsed spiritual supports, while respecting preferences of those avowedly non-religious or holding private views. The act of soliciting wishes brings clinician humanity to the fore and has been an important opportunity for experiential education for residents in our unit. The 3 Wishes Project helps to realize the experiences and expressions of spirituality for those dying, living, and working in the ICU. ■

CANADA RESEARCH CHAIR IN RESPIRATORY MUCOSAL IMMUNOLOGY

Dr. Jeremy Alexander Hirota

Dr. Hirota, assistant professor of medicine was appointed Canada Research Chair in Respiratory Mucosal Immunology in April 2017. Since this time, Dr. Hirota has recruited 4 graduate students, co-supervises an additional 2 graduate students, and has supervised a postdoctoral fellow (now employed in industry). During the summer of 2018, Dr. Hirota supervised 4 undergraduate summer students. All of Dr. Hirota's directly supervised students are based at St. Joseph's Research Institute within the Firestone Institute for Respiratory Health.

The focus of Dr. Hirota's work is understanding how transport mechanisms in the respiratory mucosa contribute to lung health and chronic disease. Funding from SickKids Hospital and Cystic Fibrosis Canada are exploring the relationship between ATP Binding Cassette Transporter C4 (ABCC4) and Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) as a potential means for improving treatment in cystic fibrosis patients. In 2018, Dr. Hirota received a CIHR Project Grant (2018-2023) for studying ABCC4 in the context of asthma, an Ontario Lung Association Grant-in-Aid for studying ABCC4 in the context of COPD (2018-2019), and an NSERC Discovery Grant (2018-2023) for exploring the impact of mechanical forces associated with breathing on airway epithelial cell biology. In 2018, Dr. Hirota also received a federal infrastructure grant (John R. Evans Leaders Fund – Canadian Foundation for Innovation) and a SickKids New Investigator Research Award (2018-2021).

To facilitate Dr. Hirota's interdisciplinary research, he has integrated with the Departments of Mechanical Engineering, Chemical Engineering, and Engineering Physics, resulting in shared operating grant funds and student supervision. ■

CANADA RESEARCH CHAIR IN THROMBOSIS

Dr. Jeffrey Weitz

Dr. Weitz has held this Tier 1 chair since 2001. The chair was renewed in 2008 and again in 2015. This chair provides salary support for Dr. Weitz and has been used to fund his research program. In addition to the chair, the Canada Foundation for Innovation has twice provided funds to purchase state-of-the-art equipment that is used by Dr. Weitz and other investigators at the Thrombosis and Atherosclerosis Research Institute. Focusing on thrombosis, this chair facilitated (a) the successful Canadian Institutes of Health Research (CIHR) Team Grant in Venous Thromboembolism that was awarded to Dr. Weitz and the McMaster Thromboembolism Group in 2006 and provided $4.2 million over seven years, (b) the $35 million Canadian Foundation for Innovation award for Large Scale Institutional Endeavors that provided one-third of the funding for the David Braley Research Institute at the Hamilton General Hospital site, (c) the CIHR Foundation Grant awarded to Dr. Weitz, which will provide $2.8 million over 7 years, and (d) Heart and Stroke Foundation awards that provide additional funds to Dr. Weitz's research program. ■

Canadian Foundation for Innovation Award for the Large Scale Institutional Endeavour — $35M