The research accomplishments of the department are particularly noteworthy given the increasing emphasis on clinical productivity and the competitive nature of the grant review process. — Dr. Jeffrey Weitz

The mandate of the Associate Chair, Research is to promote and facilitate research within the Department. To meet this mandate, the Associate Chair has focused on the following activities: (1) ensuring the success of junior faculty involved in research activities through advice and mentoring, (2) updating the scoring system that was implemented to quantify research output of faculty for purposes of remuneration and promotion and tenure, (3) ensuring that adequate departmental resources are earmarked for research, and (4) coordinating internal peer review of tri-council grant submissions.

The Associate Chair, Research meets with all new recruits and provides feedback to the Department Chair regarding their research potential. Those selected for faculty appointments in the research stream meet with the Associate Chair on a regular basis for mentorship and advice regarding grant applications, funding and career planning. The Associate Chair also provides advice to department members regarding new funding opportunities and research strategies.

The Associate Chair, Research serves as a member of the Departmental Executive, Research Executive, Promotion and Tenure, Executive Finance, and Alternate Funding Plan Committees. The role of the Associate Chair on these committees is to advise and advocate for research.

The Department of Medicine offers Internal Career Awards for new faculty members. These awards have tenure for up to three years and are granted on a competitive basis. Awards are available for both research and education and are aimed at fostering the next generation of researchers and educators. Funding from this source can be used to offset clinical expenses, thereby increasing protected time for research. The Associate Chair, Research is a member of the committee that reviews and prioritizes the application for Internal Career Awards.

The Department of Medicine continues to be a major contributor to the research productivity of McMaster University. The amount of research funding for 2015-16 was $27 million. The majority of this funding came from peer-reviewed sources with 65% from tri-council and 12% from National Centres of Excellence (see Figure 1). Overall, there was $20.5 million in operating awards and $1.7 million in career awards (see Figure 2). The total amount of research funding has decreased from the previous year.

“Awards are available for both research and education and are aimed at fostering the next generation of researchers and educators.” — Dr. Jeffrey Weitz
mostly due to an increase in research funding held at our partner hospitals, the change in the way research funding is reported and the competitive nature of the grant review process. The research accomplishments of the department are particularly noteworthy given the increasing emphasis on clinical productivity and the competitive nature of the grant review process.

“Several major studies showcase positive breakthroughs in future treatments for blood clotting, obesity and irritable bowel syndrome, and there are dozens of other important studies underway.” — Dr. Jeffrey Weitz
The Population Health Research Institute (PHRI) was established in 1999, having evolved from the highly successful Preventive Cardiology and Therapeutics Research Program that was initiated in 1992 by Dr. Salim Yusuf. It has been ranked in the top 10 research institutes in the world and currently has 380 members of whom 45 are scientists. The primary objective of PHRI is to lead international health research focused on the causes of chronic diseases and their prevention or treatment. In the last decade PHRI research has grown and expanded to include studies looking at the role of infectious diseases such as TB pericarditis, Chagas, Rheumatic Fever and Influenza vaccine associated with CVD events.

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**PROGRAM AREAS**

PHRI continues to be at the forefront of research in a number of areas with 352 publications in 2015-2016 (with 11 in NEJM, 11 in Lancet and 11 in BMJ). Our areas of research include:

- **Core Expertise**
  - CVD Prevention and Treatment
  - Arrhythmia and Thrombosis
  - Acute Coronary Syndromes
  - Perioperative Medicine
  - Global Health
  - Diabetes
  - Stroke
  - Population Genomics
  - CV Surgery
  - Neglected Diseases (TB pericarditis and RHD)

- **Emerging Areas of Research**
  - Obesity and Bariatric surgery
  - Heart Failure
  - Cardio-Oncology
  - Patient Centered Care
  - Digital Health
  - Health systems’ Knowledge Translation
  - Early life influences on CVD
  - Acute and chronic Renal diseases
  - Epidemiology of chronic obstructive airway disease

PHRI scientists also collaborate extensively with other researchers in over 80 countries and with many other research groups in Hamilton.

**RESEARCH NETWORKS**

PHRI scientists lead several national networks; CVCD Alliance led by Sonia Anand, C-SPIN (Canadian Stroke Prevention Intervention Network) led by Jeff Healey and; Salim Yusuf and PJ Devereaux as co-leads and as members of the Ontario SPOR OSSU center.

PHRI also leads the PURE study network in 25 countries and leads 55 trials involving over 60 countries.

**CIHR FOUNDATION GRANTS**

CIHR announced the results of the 2016 Project Grant in July and several PHRI Scientists were awarded funding:

- **SANJIT JOLLY**
  - CLEAR ($2,450,224 over 5 yrs)

- **MIKE WALSH**
  - ACHIEVE ($2,652,218 over 5 yrs)

- **JEFF HEALEY**
  - ARTESIA ($100,000 over 1 yr)

- **PHILIP JOSEPH**
  - A Multi-National Study ($85,000 for 1 yr)

**PUBLICATIONS:**

with 11 in NEJM, 11 in Lancet and 11 in BMJ

**OTHER NEW STUDIES**

Several new clinical studies started this year. They include:

- **G-CHF**
  - Led by S. Yusuf and H. Dokainish, this is a prospective global registry study of approximately 20,000 heart failure patients enrolled over 5 years from North America, South America, Europe, Africa, Asia and the Middle East. The primary event outcome of the study will be mortality, by cause. Secondary event outcomes will include non-fatal major events (both resulting in and not resulting in hospitalization).

- **ATLAS S-ICD**
  - (Avoid Transvenous Leads in Appropriate Subjects S-ICD) study led by J. Healey, is a multi-center, randomized open-label parallel group clinical trial to show the use of a sub-cutaneous ICD (S-ICD), compared the use of standard, single-chamber transvenous implantable cardioverter defibrillator (TV-ICD), will result in fewer perioperative and long-term device-related complications, and will have a similar rate of failed appropriate clinical shocks and arrhythmic death.

- **INVICTUS**
  - Led by Drs. Stuart Connolly and Salim Yusuf, this is a combined registry and RCT program of 17,000 subjects in over 20 countries to determine if: a) in patients with rheumatic valvular heart disease (RVHD) and who are in atrial fibrillation or flutter (AF/flutter) and have other stroke risk factors, rivaroxaban is non-inferior to vitamin K antagonists (VKAs) for prevention of stroke or systemic embolism; b) in patients with RVHD, either with AF/flutter but unsuitable for VKA therapy, or with sinus rhythm but with high risk, rivaroxaban is superior to aspirin for prevention of stroke or systemic embolism.
NOTABLE RESULTS:
HOPE-3 reported results at the ACC in Chicago on April 2nd, 2016. This study, led by Salim Yusuf, Eva Lonn and Jackie Bosch, which randomized 12,705 patients > 55 years of age with moderate CV risk factors followed an average of 5 years, demonstrated that statins reduced CVD by 25% irrespective of risk of LDL levels, whereas BP lowering was only effective in those with elevated BP, and potentially harmful in those with "normal" BP at entry into the study. Combined use of BP lowering and statins reduced CVD by 40% in those with hypertension. The results were published in three papers simultaneously in the N Engl J of Medicine in May 2016.

PURE – Using data from the PURE study, Dr. Andrew Mente has been studying the outcomes of salt intake on CVD. There were several publications in 2015 and 2016 from this research including collaborative work with PHRI’s International Senior Fellows Dr. Hans Mann and Dr. Martin O’Donnell. Most recent publications can be found in NEJM, JAMA, and CJC.

RECENT AWARDS /RECOGNITION (JULY 2015 – JUNE 2016):

STUART CONNOLLY
Dr. Stuart Connolly was awarded the Distinguished Scientist award by the Heart Rhythm Society for outstanding contributions to the field of cardiovascular pacing and/or cardiac electrophysiology.

SONIA ANAND
Dr. Sonia Anand received the 2016 Canadian Women’s Heart Health Advocacy Award which recognizes outstanding commitment to improving the heart health of women through advocacy, awareness, and support. It recognizes outstanding commitment in mobilizing women and health professionals to take heart health seriously and act to reduce women’s risk of heart disease.

DORAIRAJ PRABHAKARAN
Dr. Doriaj Prabhakaran, one of PHRI’s International Scholars, was named the top researcher in Medicine, in India by a study conducted by Scopus and the Department of Science and Technology.

SUMMARY:
The scientific productivity and impact of the PHRI has grown significantly with the expansion of existing programs and the development of new areas for research. PHRI is one of the world’s highest impact health research institutes. We are grateful to the hospital, the university and the broader Hamilton community for their support.

The Thrombosis & Atherosclerosis Research Institute (TaARI), occupies three floors of the David Braley Research Building at the Hamilton General campus. This state-of-the-art research institute has facilitated the melding of 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. Jeffrey Weitz, Executive Director, continues to provide leadership to the core research programs at TaARI which include:

- Experimental Thrombosis and Atherosclerosis (ETA) Program, which under the directorship of Dr. Weitz conducts fundamental research on the interplay among thrombosis, atherosclerosis, diabetes, obesity, cancer, and inflammation.
- Clinical Thromboembolism Program (CTP), is led by Dr. Sam Schmult and performs research that informs optimal prevention, diagnosis and treatment of patients with thrombotic problems, as well as research in nutrition and translation grammar aimed at optimal transfer of this information to the bedside and the community. This city-wide program includes all Hamilton Health Sciences hospital sites as well as St. Joseph’s Healthcare and provides clinical care to patients in the hospital and in the community who have, or are at risk for, thrombotic disorders.

Comparative Medicine Program, which is under the directorship of Dr. Shawn Petrik and focuses on the translation of basic research findings into clinically relevant models prior to evaluation in humans.
- Biometrics Group, which is led by Professor Robin Roberts and provides statistical support for all faculty and students in the various TaARI programs. Professor Roberts also leads the statistical core for the Neonatal Research Program, which is led by Dr. Barbara Schmidt. TaARI holds an annual strategic planning retreat which includes the four programs to ensure that the mission and goals of the research institute are being met. The retreat provides a venue to identify strengths, weaknesses, opportunities and threats of TaARI. The Director has built a “consensus-building” process in which to identify strengths, weaknesses, opportunities and threats for the Research Institute. The retreat also provided an opportunity to develop 5-year priorities for the Thrombosis & Atherosclerosis Research Institute. These priorities include (a) creating translational research rounds to foster collaboration between basic and clinical researchers, (b) targeted recruitment to build critical mass, (c) create an Endowed Chair as a vehicle for succession planning, (d) explore new avenues of funding to build collaborations and to diversify research investments. In 2016, the Royal College of Physicians of Canada approved a Certificate of Special Competence in Adult Thromboembolism. The Director of the certificate program is Dr. Vimal Bhagarath from TaARI’s Clinical Thromboembolism Program.

TaARI has been referred to as an "education engine" and is one of its strengths. Consistent with its academic mission of providing an excellent environment for learners, during 2015-16, TaARI faculty supervised 22 M.Sc. students, 17 Ph.D and 45 undergraduate students. Some of these students are still in training. With state-of-the-art laboratories, TaARI provides an environment conducive to learning. In fact, the environment is so collaborative and positive that many M.Sc. students continue on with TaARI principal investigators to pursue a Ph.D.

During 2015-16, TaARI maintained its research funding support at approximately $5 million from a variety of sources. Almost half of TaARI’s research support was derived from federal funding (CIHR, Canada Research Chair), 15% from the Heart & Stroke Foundation of Canada, 17% from industry and 13% from endowed chairs. The remainder came from internal and other sources. Hamilton Health Sciences and McMaster University continue to provide valuable support to help fund faculty and students, as well as operational funding for infrastructure and funding for endowed chairs.
The Firestone Institute for Respiratory Health (FIRH) has been a world-renowned centre for the investigation and treatment of respiratory diseases for more than four decades. FIRH scientists and clinicians have and continue to contribute to ground-breaking respiratory research with global impact. FIRH faculty members have been at the centre of developing the Aerocamper for inhaled drug delivery to the respiratory system, the methacholine challenge test to assist in the diagnosis of asthma, and the exploration of sputum eosinophilia as biomarker for asthma management.

FIRH provides comprehensive inpatient and outpatient 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.

FIRH’s patient-centred focus on care is achieved through the tremendous efforts of allied health care professionals, including nurses, respiratory therapists and technicians, and through the efforts of FIRH’s administrative staff. In 2015-2016, Firestone had 44,369 registrations including Sleep and Tuberculosis clinic patients. Over 21,000 of these patients underwent over 35,000 clinical tests during their visits with their physicians. The remaining patients seen in the clinic were referred from the community for pulmonology or allergy testing, without specialist consult. The total number of procedures performed, as testing may involve multiple procedures, is well in excess of 75,000.

In 2015-2016, the Firestone Institute for Respiratory Health was proud to have hosted numerous successful educational programs including the Michael T. Newhouse Lecture, the 4th Frederick E. Hargreave Lectureship, the Aerosol School and various preceptorships in collaboration with industry partners. These educational programs and lectures were extremely well received and provide current and up-to-date information for healthcare professionals in the discipline of respirology.

The Firestone faculty and staff are very proud to have participated in Hamilton’s Around the Bay Race and the Paris to Ancaster Race. Over $10,000 was raised which will help support graduate students at McMaster University.

In 2015-2016, the McMaster University Adult Respirology Training Program in association with FIRH provided training to 7 Respirology residents, 38 residents (on rotation), 13 electives, 20 medical students and 6 clinical fellows. FIRH research faculty supervised 10 full-time graduate students (candidates for Masters and for PhD) along with 4 postdoctoral fellows. In addition, FIRH hosted numerous placements for nursing students, respiratory therapist students, undergraduate and post-secondary work placements as well as countless hours of high school students earning mandatory community service hours.

FIRH conducts research to increase understanding of respiratory health and disease across the life cycle through collaborative basic and clinical investigations with the expectation of improving patient care. The proximity of research teams to clinical services has allowed conduct of highly relevant and well-powered clinical studies, and ensured rapid incorporation of new knowledge into the care of patients. This integration also strongly influences the education of physicians and allied health care professionals.

FIRH research is wide-ranging, from studies of smooth muscle physiology and intracellular signalling through experimental disease models to clinical trials and extends to population health and policy. The research productivity of FIRH is attested to by the high quality and impact of the peer-reviewed publications. In 2015, FIRH faculty was listed as authors on 186 peer-reviewed publications, including several in high impact international publications. Since 2009, current FIRH faculty were listed as an author on over 600 peer-reviewed publications and presented their research at over 100 conferences and events throughout the world.

Firestone Institute for Respiratory Health continues to excel in diverse areas of research. Dr. Malcolm Sears is the Director of the Canadian Healthy Infant Longitudinal Development study (CHILD) which has enrolled almost 3,000 infants across Canada. The Hargreave Sputum Laboratory at the Firestone Institute for Respiratory Health, under the leadership of Dr. Param
Research Director; and Dr. Stewart Pugsley and O’Byrne, Executive Director; Dr. Martin Kolb, the Firestone Institute in 2015–2016 were Dr. Paul research with the pharmaceutical industry.

Support is also obtained through collaborative OTS, the NIH and other public agencies. Substantial research programs is provided by CIHR, CFI, the area of pulmonary fibrosis. Funding for these Dr. Nathan Hambly will enhance FIRH research in substantial translational research. The addition of and molecular biology of pulmonary fibrosis with a smooth muscle cells in airway disease. The labs the basic mechanisms of airway and vascular Additionally, our researchers continue to investigate immunotherapy for allergic diseases and asthma is many clinical trials that aim at personalized medicine to treat severe asthma and COPD. Peptide Nair as Medical Director and Dr. Helen Neighbour have been at the centre of the Aerocamber for inhaled drug delivery to the respiratory system. “FIRH faculty members have been at the centre of developing the Aerocamber for inhaled drug delivery to the respiratory system.” — Dr. Paul O’Byrne

Nair as Medical Director and Dr. Helen Neighbour as Deputy Director, is world renowned and attracts many clinical trials that aim at personalized medicine to treat severe asthma and COPD. Peptide immunotherapy for allergic diseases and asthma is another major research area, led by Dr. Mark Larché. Additionally, our researchers continue to investigate the basic mechanisms of airway and vascular smooth muscle cells in airway disease. The labs of Drs. Ask, Janssen and Kolb explore the cellular and molecular biology of pulmonary fibrosis with a substantial translational research. The addition of Dr. Nathan Hambly will enhance FIRH research in the area of pulmonary fibrosis. Funding for these research programs is provided by CIHR, CFI, the OTS, the NIH and other public agencies. Substantial support is also obtained through collaborative research with the pharmaceutical industry.

Providing leadership and strategic direction for the Firestone Institute in 2015–2016 were Dr. Paul O’Byrne, Executive Director; Dr. Martin Kolb, Research Director; and Dr. Stewart Pugsley and

Dr. Gerard Cox, Clinical Directors; and Members of the FIRH faculty hold important administrative posts locally, including Dr. Paul O’Byrne, Chair of the Department of Medicine at McMaster University, Dr. Martin Kolb, Division Director of Respiratory Medicine; and Dr. Rebecca Amer, Program Director for Adult Respiratory Residency training at McMaster University.

Faculty and staff wish to acknowledge and thank those who continue to support the efforts of the Institute. In particular, we thank the St. Joseph’s Healthcare and its Foundation and the many people Faculty and staff wish to acknowledge and thank those who continue to support the efforts of the Institute. In particular, we thank the St. Joseph’s Healthcare and its Foundation and the many people those who continue to support the efforts of the Institute. In particular, we thank the St. Joseph’s Healthcare and its Foundation and the many people

AllerGen NCE Inc. (AllerGen), the Allergy, Genes and Environment Network, is a national research network whose mission is to reduce the morbidity, mortality and socioeconomic impacts of allergy, asthma, anaphylaxis and related immune diseases.

AllerGen was established in 2004 by Innovation, Science and Economic Development Canada (formerly Industry Canada) through the Networks of Centres of Excellence (NCE) Program. It is hosted at McMaster University and led by Scientific Director and CEO Dr. Judah Denburg, William J. Walsh Chair in Medicine, Professor of Medicine and Director, Division of Clinical Immunology and Allergy.

AllerGen has built capacity in over 1,400 students and trainees, and granted $2.8 million in trainee awards and fellowships.

AllerGen gratefully acknowledges ongoing support from McMaster University and especially Dr. Paul O’Byrne, Dean & Vice-President, Faculty of Health Sciences; Dr. Rob Baker, Vice-President, Research; Dr. Stephen Collins, Associate Dean, Research, Faculty of Health Sciences; and Dr. Patrick Deane, President and Vice-Chancellor, and a member of AllerGen’s Board of Directors.

AllerGen NCE Inc.

Led by internationally recognized Canadian researchers with expertise across a wide range of disciplines, the Network’s 31 active research projects and strategic initiatives aim to promote earlier diagnosis, disease interception, better treatment, and optimal outcomes for Canadians with allergic diseases.

In 2015–2016, AllerGen engaged 94 Network Investigators and collaborators, 318 students, new professionals, research associates and technicians, and 125 partner organizations across academia, industry, not-for-profit and government.

In November 2015, AllerGen secured its final three years of federal funding through the NCE program. This ongoing support—confirmed following a rigorous assessment of AllerGen’s achievements and plans—will allow the Network to continue its work in allergic disease and asthma research, training and innovation to 2019.

Students, new professionals, research associates and technicians engaged with Allergen

Partner organizations across academia, industry, not-for-profit and government agencies collaborated

AllerGen research teams focus their discovery, commercialization and knowledge mobilization efforts on:

**THREE LEGACY PROJECTS**
- The Canadian Healthy Infant Longitudinal Development (CHILD) Study;
- The Clinical Investigator Collaborative (CIC); and
- The Canadian Food Allergy Strategic Team (CanFAST).

**THREE ENABLING PLATFORMS**
- Gene-Environment Interactions;
- Biomarkers and Bioinformatics; and
- Patients, Policy and Public Health.
ALLERGEN LEGACY PROJECT #1
THE CANADIAN HEALTHY INFANT LONGITUDINAL DEVELOPMENT (CHILD) STUDY

Co-led by Dr. Malcolm Sears, Professor, and Dr. Padmaja Subbarao, Adjunct Professor, McMaster University

The CHILD Study is an internationally recognized birth cohort study that is following 3,500 Canadian children and their families from pre-birth to school age and beyond.

Launched in 2008 with $12 million from AllerGen and the Canadian Institutes of Health Research (CIHR), the CHILD Study offers an unprecedented pool of early-life human genetics, epigenetics and microbiome data. It is the only Canadian study and one of a few in the world that allows us to study the early-life origins of asthma, allergy, and other chronic diseases, and to link these findings to children’s health outcomes and development, including obesity, diabetes, other metabolic disorders, neurodevelopment, school performance, and mental health.

Additional CHILD Study participants from McMaster University include Drs. Judah Denburg, Paul O’Byrne, Sonia Anand, Russell de Souza and Joseph Macri.

2015-16 research based on CHILD Study data showed that the four gut bacteria may protect kids from asthma; prenatal fruit consumption boosts babies’ cognitive development; and artificially sweetened drinks during pregnancy may increase the risk of infant obesity

ALLERGEN LEGACY PROJECT #2
THE CLINICAL INVESTIGATOR COLLABORATIVE (CIC)

Co-led by Dr. Paul O’Byrne, Professor, and Dr. Gail Gauvreau, Professor, McMaster University

The CIC is a multi-centre Canadian-based Phase II clinical trials group that evaluates potential drug candidates for the treatment of allergic asthma, severe asthma and allergic rhinitis.

The CIC has positioned Canada as a leader in the discovery, development and commercialization of new tests and treatments for the benefit of individuals suffering from allergic airway diseases.

With a globally unique allergen inhalation challenge model and proprietary SOPs, the CIC offers biotechnology and pharmaceutical companies academic leadership in drug development research, conducts add-on experiments to establish the mechanism of action for new drugs, and publishes novel data in high-impact peer-reviewed journals.

Additional researchers and McMaster University faculty involved in the CIC include Drs. Parameswaran Nair, Mark Larché, Paul Keith, Susan Waserman and Helen Neighbour.

Since 2005, the CIC has created 40 jobs, undertaken 22 clinical trials and attracted over $24 million in R&D investment.

ALLERGEN LEGACY PROJECT #3
THE CANADIAN FOOD ALLERGY STRATEGIC TEAM (CANFAST)

CanFAST is a national, multi-centred, transdisciplinary research consortium that produces new knowledge about food allergy and translates it into clinical and public health practice.

Based on their 2015 survey, the largest to date on food allergy prevalence in Canada, CanFAST researchers estimate that 2.5 million Canadians are affected by food allergy.

In 2015-16, CanFAST’s Cross-Canada Anaphylaxis Registry (C-CARE) generated new findings that will inform future clinical management and public health standards.

CanFAST is co-developing, with multiple stakeholders, a National Food Allergy Strategy (NFAST): a knowledge mobilization platform that will position Canada as a global leader in improving the management of food allergy across environments and settings.

McMaster University allergy specialists involved in the CanFAST research program are Drs. Susan Waserman and Manel Jordana.

C-CARE studies found that anaphylaxis is increasing among Canadian children: the percentage of emergency department visits due to anaphylaxis doubled over a four-year period.

Further information, including copies of AllerGen’s Success Stories, a publication that makes Network research accessible to the public, is available at allergen-nce.ca.
The Farncombe Family Digestive Health Research Institute opened in January 2009 following donations in 2004 and 2008 totalling $18.5 million from the Farncombe family (http://farncombe.mcmaster.ca ). The gift funded endowed chairs and the construction of Canada’s first germ-free mouse facility. This was complemented by a CIHR funded metagenomics/DNA sequencing unit. The Institute contains basic and clinical scientists and is closely affiliated with the Division of Gastroenterology and the Farncombe Institute secured a large CIHR SPOR grant, which places McMaster in a national leadership position in translational and clinical research in gastrointestinal diseases.

The Institute’s primary goal is to better understand the role of the intestinal microbiota in the maintenance of health and in the expression of diseases of the intestinal tract and beyond, and to translate this knowledge into novel therapeutic approaches. Basic research in the Institute addresses interactions between the intestinal microbiota and the intestinal immune, endocrine, neural, and motor systems. It also extends beyond the gut to address the influence of the microbiota on host metabolism and obesity, on brain and behaviour, and on exercise-derived health benefits. Human studies examine the maternal influence (nutritional status or antibiotic exposure) on microbial colonization of the gut in early life and on child development. Our studies also examine the ability of commensal bacteria in the upper gut to digest gluten into immunogenic or non-immunogenic peptides, raising new possibilities for the treatment of celiac and related diseases. In clinical research, the Institute has pioneered studies on the use of Fecal Microbial Transplantation in IBD and other diseases such as pseudo-obstruction, and has been the first to demonstrate the ability of a probiotic bacterium to improve depression in man.

This year, additional funding was secured from the Farncombe family to optimize the Institute’s performance over the next five years. In addition, under the leadership of Paul Moayyedi, the Division of Gastroenterology and the Farncombe Institute secured a large CIHR SPOR grant, which places McMaster in a national leadership position in translational and clinical research in gastrointestinal diseases. The gift funded endowed chairs and the construction of Canada’s first germ-free mouse facility. This was complemented by a CFI funded metagenomic/DNA sequencing unit. The Institute contains basic and clinical scientists and is closely affiliated with the Division of Gastroenterology and the Farncombe Institute secured a large CIHR SPOR grant, which places McMaster in a national leadership position in translational and clinical research in gastrointestinal diseases.

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

Faculty members who participate in centre research include:
- Dr. Sonia Anand (Director, Department of Medicine and Epidemiology),
- Dr. Joseph Bayene (Department of Epidemiology),
- Dr. Russell de Souza (Department of Epidemiology),
- Dr. David Meyre (Department of Epidemiology),
- Dr. Guillaume Pare (Department of Pathology), and Dr. Zena Samaan (Department of Psychiatry).

Associate Faculty include:
- Dr. Judith Denburg (Medicine),
- Dr. Phil Britz-McKibbin (Chemistry),
- Dr. Mark Lee (Pathology and Molecular Medicine),
- Dr. Andrew Merito (Epidemiology),
- Dr. Malcolm Sears (Medicine),
- Dr. Jennifer Stearns (Medicine),
- Dr. Mike Surette (Medicine),
- Dr. Gita Wahi (Pediatrics).

Current Research Projects at the Chanchlani Research Centre:
- Aboriginal Birth Cohort (ABC) – PI’s Dr. Sonia Anand, Dr. Gita Wahi
- Canadian Alliance for Healthy Hearts & Minds (CVDCC Alliance) – PI’s: Dr. Sonia Anand, Dr. Russ de Souza

In 2016, Institute members published a total of 55 peer-reviewed papers. The Institute’s research is funded from external sources that include CIHR, Crohn’s and Colitis Canada and NIH, as well as private sector sources that include Nestlé.
diet and gene interaction study (DIGEST) PI - Dr. Russ DeSouza

GENOA (Genetics of Addiction) – Dr. Zena Samaan

Dengue Population Genomics study – Dr. Gui Pare, Dr. Mark Loeb

South Asian Heart Risk Assessment Project (SAHARA) PI’s: Dr. Sonia Anand

South Asian Birth Cohort (START) PI: Dr. Sonia Anand, Dr. Russ deSouza

The Nutrition and Genetic Interactions Birth Cohort (NutriGen) Alliance PI’s Dr. Sonia Anand, Dr. Russ de Souza, Dr. David Meyre, Dr. Joseph Beyene, Dr. Guillaume Pare

DoHad Team Grant - Deciphering the metabolic signatures of the metabolic syndrome (MetS) in young children: Drs. J Beyene, P Britz-McKibbin, R de Souza, G Pare, P Subbarao, S Atkinson, R Helegrave, S McDonald, D Meyre, K Morrison, M Sears, K Teo, P Ritvo, J Stearns, M Surette, G Wahi, M Zulyniak

GENEUS (Genetic and Enviromental Effect in weIght evolution in University Students): PI: Dr. David Meyre

IMAGE (EpIgenomics of Metabolic AGing): PI: Dr. David Meyre, co-I: Dr. Jean-Louis Gueant

DESI-GDM Qualitative Study - A DiEt and phySIcal activity intervention in South Asian women at risk of Gestational Diabetes: A feasibility study and pilot randomized trial (DESI-GDM): Drs. K Adamo, J Beyene, H Gerstein, S Lear, S McDonald, P Ritvo, D Sherfaji, G Wahi, and M Zulyniak

Identification of the shared biological and sociodemographic factors underlying cardiovascular disease and dementia risk: PI: Dr. Guillaume Pare

Grants and Awards:
In 2015-17, faculty within the CRC supervised a total of 6 junior faculty, 4 Clinical Fellows, 17 post-doctoral fellows, 19 PhD, 21 Masters, 4 BHSc, and 87 undergraduate students.

Furthermore, CRC faculty received 36 grants from peer-review sources, private donors, and industry totalling around $8,974,800 during 2015-2016 as averaged over the full funding grant period. (see Appendix 1)

In 2015-2016 (Jan 2015-Oct 2016) PGP Faculty have published 80 papers in peer – reviewed journals.

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 based on their scholarly contributions to Global Health. Each year a discipline within Global Health (i.e. Determinants of Health, Policy Development, Innovative Solutions) is chosen, and an internal review committee at McMaster reviews leading candidates.

Past Recipients include:

2012: First Annual Chanchlani Global Health Research Award Recipients:
Dr. Madhukar Pai, MD, PhD
Associate Professor of Epidemiology, McGill University
“The freakonomics of TB control in India”

2015: Professor Ab Osterhaus, an esteemed Virolologist, and Head of the Department of Virolgy of the Erasmus MC Rotterdam presented his lecture entitled “From Zoonosis to Pandemic in a Changing World” on February 25, 2015.

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

2014: Dr. Hans Rosling, PhD, MD
Professor of International Health, Karolinska Institute, Co-founder & Chairman, Gapminder Foundation

2015: Dr. Nikika Pant Pai, MD, MPH, PhD
Associate Professor of Medicine, McGill University
“Point-of-care tests for HIV: innovation, synergy and impact”
The GERAS Centre is a collaboration of researchers, clinicians and educators at St. Peter’s Hospital that aim to enhance geriatric care and improve quality of life for seniors. Since its foundation in 2013, the GERAS Centre has emerged as an international leader in fractures, frailty, and dementia research. The Centre, based out of Hamilton Health Sciences (HHS’s) St. Peter’s Hospital (SPH) in Hamilton, aims to “advance health care through education and research.” This aim is operationalized by linking research, practice, and education to realize point-of-care improvements for seniors. Strong partnerships with the St. Peter’s Centre for Healthy Aging, the Health TAPESTRY primary care initiative ($8.7 million in funding from Health Canada), the Canadian Multicentre Osteoporosis Study (CaMos), Osteoporosis Canada, the Hamilton Arthroplasty Research Group, and Medical Pharmacies (Canada’s leading pharmacy specializing in services to long term care and retirement homes) support the success of the GERAS Centre’s activities.

**Strategic Plan**

The strategic goal of the GERAS Centre is “to advance care for older adults by translating evidence-informed research into clinical geriatric practice and education.” The two overarching research themes for the Centre are ‘Mobility & Independence’ and ‘Cognitive Health’. These are addressed through three strategic directives: 1) Research to Improve Quality of Life, 2) Evidence-informed Geriatric Care, and 3) Interprofessional Education.

**Leadership and Team**

Dr. Alexandra Papaioannou leads the GERAS Centre as the Executive Director. She is a Professor of Medicine at McMaster University, a Geriatrician at HHS, and the Canadian Institutes of Health Research (CIHR) Eli-Lilly Research Chair. GERAS also benefits from the guidance of two Associate Scientific Directors, Dr. Courtney Kennedy and Dr. George Ioannidis, both part-time Assistant Professors at McMaster University and accomplished Research Scientists. Other key members of the Centre include:

- Dr. Sharon Marr, Associate Professor of Medicine at McMaster University; Division Director of Geriatric Medicine for the Regional Geriatric Program (RGP)
- Dr. Brian Misiaszek, Chief of Geriatric Medicine at SPH of HHS; Associate Professor of Medicine at McMaster University
- Dr. Christopher Patterson, Professor of Medicine at McMaster University; Chief of Geriatric Services at HHS
- Dr. Tricia Woo, Associate Professor of Medicine at McMaster University, Geriatrician at HHS

**STRATEGIC DIRECTIVES:**

1. Research to Improve Quality of Life
2. Evidence-informed Geriatric Care
3. Interprofessional Education

The GERAS Centre provides training to graduate students (in Master and PhD programs) and post-graduate trainees, as well as mentorship to a number undergraduate students from different backgrounds, including medicine, rehabilitation medicine, gerontology, life sciences, business, and communications.

**A Sample of Research Affiliates**

- Dr. Johnathan Adachi, Professor of Medicine at McMaster University, Director of the Hamilton Arthritis Centre at St. Joseph’s Healthcare Hamilton (SJHH)
- Dr. Sharon Kaasalainen, Associate Professor, School of Nursing, McMaster University
- Dr. Lora Giangregorio, Associate Professor, Department of Kinesiology, University of Waterloo
- Dr. Andy Kin On Wong, Co-Director of CaMos BQS & MGS

**Special Projects**

The GERAS Centre is proud to conduct innovative research and knowledge translation activities within its core themes. Some project highlights from 2015-16 activities are shared below.

**Mobility & Independence**

**RECOMMENDATIONS FOR PREVENTING FRACTURE IN LONG-TERM CARE**

Dr. Papaioannou led the first clinical practice guidelines focusing on preventing fractures among the frail elderly in long-term care. A full toolkit to support long-term care homes in implementing the recommendations is available on the GERAS website, and is continually updated with targeted resources, such as videos, checklists, and other materials.

**TAPESTRY TRIAGE**

In partnership with Health TAPESTRY, GERAS is leading the TRIAGE pilot study examining a multi-faceted frailty prevention strategy that builds on a successful program delivered in Australia (the Frailty Intervention Trial), and is the first study of its kind in primary care. TRIAGE has been featured by HHS multiple times for helping one participant skate again, and helping another to be able to go to a dance.

**FRACTURE RISK SCALE**

The GERAS team has created and validated an algorithm that will automatically identify long-term care residents at risk of falling within the next year using RAI-MDS data. It will be implemented internationally, and allow long-term care homes to customize interventions for preventing fractures.
**FIT HIPS**

In collaboration with the Regional Joint Assessment Program, the Hamilton Arthroplasty Group, and the Young Men’s Christian Association (YMCA) of Hamilton, Fit Hips introduces a multi-modal intervention for persons undergoing hip surgery both pre- and post-operation. Reducing patients’ frailty is expected to improve surgery outcomes for this Quality-Based Procedure.

**TAP-CARING**

Contributing factors to caregiver stress are being identified in this study to inform future interventions that support formal and informal caregivers in the community.

**Cognitive Health**

DANCE

This work aims to improve the cognitive and physical function of older adults who are frail/pre-frail and/or have mild cognitive impairment. The dance intervention is delivered in partnership with the YMCA of Hamilton, and is funded by the Labarge Optimal Aging Initiative and the Alzheimer Society.

**Needs of Caregivers for Persons with Dementia**

By engaging the caregivers of persons with dementia through in-person interviews, GERAS has identified gaps in education and resources for caregivers of persons with dementia. Preliminary results are informing a new project, iGerCare, and final results are pending.

**IGERICARE**

Led by GERAS Member and HHS Geriatrician Dr. Richard Stramko, iGerCare will provide an online platform for dementia resources and social support to fill the needs gap, the content of which will be determined by geriatricians, caregivers of persons with dementia, and other clinical and community experts. This initiative has received $90,000 in funding to date from the Canadian Centre for Aging and Brain Health Innovation, Hamilton Health Sciences Foundation, Regional Geriatric Program Central, and Alzheimer Society of Brant, Haldimand Norfolk, Hamilton Halton.

**Reports: Endowed Chairs**

“These positions are prestigious, but they also allow our scientists to investigate critically important areas of medicine and to recruit and develop the next generation of pioneering researchers.”

— Dr. Paul O’Byrne

**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 position continues to fund ‘The training the rheumatologist of tomorrow’ campaign which received an additional $100,000 gift from the Canadian Rheumatology Association. This is the second phase of a Pan-Canadian study to identify what rheumatology faculty, administrators and learners identified as effective means and messages to attract future learners.

Physician manpower resources in Rheumatology remain static, leaving most areas of the country underserviced. The Chair’s current thrust is to facilitate enhanced recruitment in rheumatology training programs. Projected shortages will be significant if action is not taken at this time.

With the support from the Chair, the next level of engagement is to develop community-based educational experiences offered at the earliest opportunity in medical training and throughout postgraduate training. A key element of this national effort will be to promote community faculty development that will meet Royal College standards for training and evaluation.

In continuing the commitment to education in Rheumatology, Dr. Cividino co-chaired the first ‘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.
The Actavis Chair in Rheumatology for Better Bone Health has been used to further our research interests in both the effective transfer of guidelines to practice, and osteoporosis through the support of George Ioannidis and Dr. Andy Kin On Wong in their research endeavors in rheumatology.

Dr. George Ioannidis has continued his work with CaMos, GLOW, and work in long-term Care to identify those who are at high-risk for hip fracture. In the past year, he has been part of a team, led by Dr. Alexandra Papaioannou, which has examined osteoporosis care in the long-term care setting, the impetus for the development of guidelines. His primary focus is to develop and further improve upon methods for disease diagnosis and disease progression evaluation, identify risk factors that are predictive of disease and disease progression, and to examine the effectiveness of drug therapies and interventions that improve patient health outcomes and health related quality of life. He has studied healthcare utilization following a fracture and the association between glucocorticoids and fractures. Finally, he has taken part in the validation the Canadian FRAX tool in the Canadian population and compared the FRAX tool with the Canadian Association of Radiologists and Osteoporosis Canada (CAROC) tool. These two instruments are the leading tools that are used across Canada to assess individual fracture risk. His second area of research focus is genomics and my goal is to improve the quality of living for older adults with chronic diseases. Specifically, he is interested in screening strategies and the identification of individuals who are in the early stages of frailty; trajectory recognition of frail older adults; and the investigation of modifiable risk factors for frailty that consist of lifestyle, social, and nutritional factors. In addition, he has evaluated vitamin D levels in older adults living in long-term care. In addition to his research, Dr. Ioannidis has contributed to the education of interns, residents, undergraduate as well as graduate and postgraduate students.

Dr. Andy Kin On Wong, a past Vanier award winner, has focused his research work on bone structure and fractures. Andy has been responsible for the successful CIHR grant on bone quality that was awarded to our group. His work has focused on improving the reliability of pQCT-derived muscle area and density measures using a watershed algorithm for muscle and fat segmentation. A trimodality comparison of volumetric bone imaging technologies using pQCT, HRpQCT and pMRI was conducted. Short-term precision and validity, 1-y change, long-term precision, and least significant change were established and their association with fragility fractures has been published.

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The overall goal of Dr. Austin’s research program is to better understand the underlying cellular stress pathways that contribute to cardiovascular disease and 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 cardiovascular disease in patients with end-stage renal disease. 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) identifying a causal relationship between the ER stress response and vascular calcification. 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 and his research team have utilized state-of-the-art biochemical and molecular approaches as well as established mouse models of atherosclerosis and renal disease to better explain the underlying mechanisms responsible for end-stage renal disease and vascular complications. A number of the findings from Dr. Austin’s laboratory have been published in high-impact scientific journals. Importantly, the identification of these mechanisms have become the cornerstone for the development of novel therapies and detection methods aimed at reducing the risk of cardiovascular and renal diseases.

Key accomplishments over the past year include identification of novel mediators of vascular calcification and diabetes. These findings have been presented at numerous international research meetings and have been published in high-impact scientific journals. Dr. Austin and colleagues have also identified autoantibodies in the blood of prostate cancer patients that bind to the surface of cancer cells and promote tumor growth and clot formation. Approaches aimed at blocking this interaction are now being examined as a potential anti-cancer therapy.

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.
My role as Research Director is to further our interaction between basic 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 have been planned to identify important and relevant research areas in nephrology that directly impact patient care and treatment. This will allow both clinician scientists and biomedical researchers to develop a dynamic and relevant research program that will tackle the major issues relevant to cardio renal function and pathology. This translational and cooperative approach will allow for the development of novel therapeutic strategies that focus on our major scientific achievements and discoveries.

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, and this report is for the year 2015-16. With respect to clinical activities, we have established and maintained a position as a premier clinical site in Canada for the treatment of ALS, and patients come to the clinic from South Central Ontario, and indeed, all of Ontario and beyond. We remain grateful to Hamilton Health Sciences for their ongoing support of the clinic.

The ALS team is multi-disciplinary, and 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. Jane Allan. Ms. Shelley Curry provides the logistic and secretarial support, and Dr. Daniela Trapsa is the research coordinator. We have close collaborations with Dr. Bruno Salena and Dr. John Cunnington for gastrointestinal and respirological issues, respectively, and Dr. Peter Varey for Physiatry.

With respect to education, medical students, neurology residents, and fellows rotate through the clinic. With respect to research, we are participating in three research trials on two experimental drugs sponsored by Cytokinetics, another on Withania, another fact-finding trial (ONDRI). We have undertaken two in-house trials looking at the activity of certain compounds in CSF from ALS patients and controls, and a genetic mutational analysis of ALS patients. Our basic research continues to evolve, and we are working on the possibility that ALS terminally involves de-differentiation of motor neurons. 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.

In 2015, Dr. Sears discontinued his clinical practice after 50 years of patient care to focus fully on epidemiologic research. He continues as Principal Investigator and Director of the Canadian Healthy Infant Longitudinal Development (CHILD) Study, a large national longitudinal epidemiological study involving 3,495 families and over 30 investigators across Canada. The study was initiated in 2008 with funding by CIHR and the Allergy, Genes and Environment (AllerGen) Network of Centres of Excellence. CHILD was designed as an intensive investigation of factors responsible for development of allergy and asthma, with a particular emphasis on gene-environment interactions. A very broad definition of the environment including not only indoor and outdoor air, but psychosocial environment including maternal stress, infections and nutrition, has allowed expansion of the scope of the study to include the early origins of obesity, metabolic diseases including diabetes, and cardiovascular disease. The eldest children are now aged 8 years, and the assessments of 5 year olds will be complete in 2017.

The CHILD cohort provides a solid platform for multidisciplinary research into the Developmental Origins of Health and Disease (DoHaD). Several novel CIHR-funded studies have been added to the core CHILD study, including a study of Sleep Disordered Breathing in infants and consequent neurodevelopment, and studies of the infant microbiome and immune development. The relative absence of four bacteria from the gut of infants was predictive of development of wheezing with atopic sensitization, indicating a potential pathway to asthma, and even more importantly, opportunity for intervention and even primary prevention. Other work has identified early introduction of milk, egg and peanut as effective in reducing sensitization to these foods and potentially reducing the risk of the “atopic march” in children.

Plans are evolving for continuation of the CHILD Study beyond 5 years, with proposed assessment of the cohort at ages 8, 11, and 14 years involving multiple disciplines from pediatrics to immunology to genomics to metabolomics and many others.

The CHILD Study has forged linkages with several other cohort studies, and is the major contributor of study subjects to the McMaster based NutriGen Alliance which is examining the relationships between maternal and child nutrition, genetics and health outcomes especially related to metabolic diseases including obesity and diabetes.

Dr. Sears continues to participate in analysing and publishing data from his first longitudinal birth cohort study in New Zealand, commenced in 1972-1973. The Dunedin Multidisciplinary Health and Development Research study is now undertaking follow up assessment at age 45 years. His hope is that the CHILD Study will have similar longevity.
ENDOWED CHAIRS

BORIS FAMILY CHAIR IN EDUCATION AND INTERNAL MEDICINE
Dr. Akbar Panju

I am pleased to provide a report of the activities with regards to the Boris Family Chair in Education and Internal Medicine.

I continue to be the Division Director of General Internal Medicine at McMaster University. The Division of GIM is comprised of 35 academic general internists providing clinical and scholarly activities to our Clinical Teaching Unit and the Ambulatory Clinics.

The Boris Clinic which is made up of a Clinical Teaching Unit, Diabetic Clinic, General Internal Medicine Rapid Assessment Clinic and Medical Daycare Centre continues to provide excellence in clinical activities and educational activities.

I provided a detailed report to the Boris Family recently about the activities of the Boris Clinic. We have seen an increase of at least 30% in the number of patient visits. Our learners (residents from internal medicine and family medicine) have increased their activities in the clinic as well. A recent survey of the clinic provided useful information. Overall the patients were satisfied with the care that they received in the Boris Clinic. Our learners have rated their educational experience very highly.

We are in the process of developing a point of care ultrasound evaluation in the Ambulatory Clinic and this may be the first of its kind in an internal medicine outpatient clinic. Our quality improvement and research activities are headed by Dr. Jason Cheung and Dr. John You, and we are in the process of evaluating in a more formal way about evaluating the impact Boris Clinic has on reducing inpatient hospital length of stay, reducing emergency room visits and ultimately economic benefits by having the Boris Clinic.

The Boris Clinic experience has been an excellent one for the faculty and learners and we are in the process of expanding this type of clinic in other parts of Hamilton. We recently submitted an article to the Canadian Journal of Internal Medicine highlighting the Boris Clinic and we received positive feedback from that manuscript.

“At any one time there are 14 specialists plus 20 to 30 residents treating the 48,000 patients who visit the ambulatory environment annually.”
— Dr. Akbar Panju

DAVID BRALEY AND NANCY GORDON CHAIR IN THROMBOEMBOLIC DISEASE
Dr. Jeffrey Ginsberg

Established in 2004 via a generous gift from Mr. David Braley and Mrs. Nancy Gordon, the goal of the David Braley and Nancy Gordon Chair in Thromboembolic Disease is to contribute significantly to the body of scholarship on thromboembolic disease; to mentor and train the next generation of physician scientists in thrombosis research; to develop, implement and evaluate curricular innovations in undergraduate (MD), postgraduate and Continuing Education; and to undertake quality research in thromboembolic disease.

The major foci of my research have evolved over the last couple of years. I continue to co-supervise (along with Drs. Eikelboom and Hirsh) the research fellows that have come to McMaster. The fellows include not only local trainees but also trainees from Australia, China, Belgium, Holland, etc. During 2015-16 a number of articles were published in peer-reviewed journals. As well, we have twice weekly phone calls with trainees to intensely help with their research. In the coming years we will continue to place a strong emphasis on continuing with the very rigorous training program.

ELI LILLY CANADA CHAIR IN OSTEOPOROSIS
Dr. Alexandra Papaioannou

Dr. Papaioannou is a Professor in the Department of Medicine at McMaster University with joint appointment in the Division of Rheumatology. She is an Associate Member in the Department of Health Research Methods, Evidence and Impact; and a Faculty Member in the Medical Sciences Graduate Program. Dr. Papaioannou is a Geriatrician at Hamilton Health Sciences and McMaster University. The GERAS Centre focuses on research and education in improving the lives of older adults with frailty, falls and fractures. She is a member of the Scientific Advisors of Osteoporosis Canada and the International Osteoporosis Foundation (Elected), past Chair of the Scientific Advisory Council of Osteoporosis Canada (UCC) and past Chair of the Board. She was lead author of the Osteoporosis Canada Guidelines published in the Canadian Medical Association Journal 2015 and 2010. Dr. Papaioannou has authored over 290 peer reviewed publications. She is the Co-Director of the Canadian Multi-Centre Osteoporosis Study (Hamilton).

Dr. Papaioannou and the GERAS scientists, undergraduate, graduate, and postgraduate students are leading a program of research “Expanding the Frailty-Sarcopenia Collaborative funded by Hamilton Health Sciences RFA
Program. Building on the expertise of geriatric medicine on frailty in acute care, the team was funded by the HAHSO (Hamilton Academic Health Sciences Organization) for the project “Getting Fit for Hip Replacement: The Fit-Hips Pilot Randomized Controlled Trial of Multi-model Intervention in Frail Patients with Osteoarthritis”. Dr. Papaioannou is co-investigator on a number of CIHR-funded projects such as “Teams Advancing Patient Experience – Strengthening Quality (TAPESTRY) with a focus on primary care and older adults and preventing frailty. Dr. Papaioannou is also a co-investigator on “Improving Palliative Care in Long Term Care Homes Using Participatory Action Research” funded by the Technology Evaluation in the Elderly Network (TVEN). Dr. Papaioannou is the project lead for the Ontario Osteoporosis Strategy for Fracture Prevention in long-term care and together with the GERAS scientists and Waterloo University has developed a tool that predicts fractures in frail older adults and is being implemented world wide in long-term care homes.

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’s 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.

This year, my co-investigators and I published two manuscripts from our PSI Foundation-funded international multicenter cross sectional interview study examining women’s willingness to receive low molecular weight heparin prophylaxis to prevent recurrent venous thromboembolism during pregnancy and determinants of that decision. I was also a co-author on another publication describing the results of a pilot study examining the feasibility of a randomized trial of low molecular weight heparin to prevent postpartum venous thromboembolism.

I had the opportunity to present educational sessions on thrombosis and women’s reproductive issues at the annual meetings of the American Society of Hematology and the Canadian Menopause Society, as well as at the 2018 Thrombosis & Hemostasis Summit of North America, the 2016 McMaster International Review Course in Internal Medicine, and the Harvard Medical School Thrombosis and Thromboembolism Update. I was also pleased to deliver the May Cohen Lecture in Women’s Health, “Women’s Health Research: Why Should We Care”. In conjunction with colleagues from the United States, the Netherlands, the United Kingdom and elsewhere in Canada, I published a guidance document providing practical recommendations on the prevention and management of pregnancy-related venous thromboembolism, while continuing 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. The latter document should be published in 2017. I was invited to join the Society of Obstetric Anesthesia and Perinatology Venous Thromboembolism Working Group that is developing a consensus statement to assist and inform obstetric anesthesia providers caring for pregnant women receiving anticoagulant prophylaxis. I continued to serve on the Medical Advisory Committee of the Foundation for Women and Girls with Blood Disorders.

FREDERICK HARGREAVE / TEVA INNOVATION CHAIR IN AIRWAY DISEASES

Dr. Parameswaran Nair

As the inaugural holder of this endowed chair, it has indeed been my honour to continue the clinical work and the translational research program and the legacy of Professor Freddy Hargreave. In addition to the incredible national and international recognition that this Chair provided me, it has helped me to forge new national and international collaborations and to co-ordinate a number of international clinical trial programs. We received funding from CIHR, US Vasculitis Foundation, AllerGen NCE and from industry partners for our research program on the ‘measurement, mechanisms, and modulation of bronchiectasis in complex airway diseases. The collaboration with the McMaster Biointerfaces Institute and Dr. John Brennan and with Dr. Jamie Lee at the Mayo Clinic in Scottsdale are leading to the development of novel point-of-care diagnostic tests for bronchiectasis.

The success of the research program is reflected in the recruitment of two international trainees, 3 peer-reviewed publications, 52 invited lectures, and two national awards.
The lab has long been interested in the role of microbes in the irritable bowel syndrome (IBS), the most common intestinal disorder globally. Previously, we had shown that this condition can be precipitated by enteric infection initially in mice and subsequently in man (the Walkerton studies). The lab’s focus has since addressed the role of the intestinal microbiota in the maintenance of this chronic condition, as fact is known to perturb the microbiota such as infection, antibiotic exposure or stress initiate or exacerbate IBS. Several studies have shown changes in the composition of the microbiota in IBS patients but it is unknown whether this is simply a consequence of altered intestinal physiology, or whether it plays a role in the expression of the disorder. To address this, we adopted a strategy where germ-free mice are colonized with microbiota from human subjects with or without IBS. We found that only mice colonized with IBS microbiota exhibited intestinal changes reminiscent of those found in the donor IBS patients (alterations in motility, secretion and innate immunity). When we colonized mice with microbiota from patients with anxiety, anxiety-like behaviour was observed in recipient mice and this was accompanied by changes in gene expression in the domains of innate immunity and neurotransmission. These findings strongly suggest that the microbiota contributes to the expression of both the intestinal and behavioural manifestations of IBS and prompt consideration of microbiota-directed therapies for this condition. In a placebo-controlled pilot study, we next tested the efficacy of a bacterium, shown in our animal work to be anxiolytic, in IBS patients with co-morbid depression and found a significant improvement in mood that was accompanied by alterations in fMRI monitored brain activity. Our on-going work examines molecular mechanisms underlying microbiota-to-brain communications in the Farncombe Institute.

ENDOWED CHAIRS

GLAXOSMITHKLINE CHAIR IN GASTROENTEROLOGY

Dr. Stephen Collins

This Chair supports the laboratory of Dr. Stephen Collins and Dr. Premysl Berck in the Farncombe Institute, of which the chair holder is the Director. The lab’s research is supported by a CIHR Foundation grant, an NIH grant and funds from Nestle. The research program focuses on the interaction of the intestinal microbiota with the gut-brain axis and spans bench-to-bedside. Our previous work had shown that the intestinal microbiota influence this axis in a bidirectional manner. Manipulation of the microbiota alters brain chemistry and function; conversely, stress and other CNS disturbances (induction of anxiety or depression) change the microbial composition of the intestine. As a result of these findings, we coined the term “The microbiota-gut-brain axis” (Collins SM et al. Nature Rev Microbiol. 2012 PMID: 23000955).

The lab has long been interested in the role of microbes in the irritable bowel syndrome (IBS) – the most common intestinal disorder globally. Recently, we had shown that this condition can be precipitated by enteric infection initially in mice and subsequently in man (the Walkerton studies). The lab’s focus has since addressed the role of the intestinal microbiota in the maintenance of this chronic condition, as fact is known to perturb the microbiota such as infection, antibiotic exposure or stress initiate or exacerbate IBS. Several studies have shown changes in the composition of the microbiota in IBS patients but it is unknown whether this is simply a consequence of altered intestinal physiology, or whether it plays a role in the expression of the disorder. To address this, we adopted a strategy where germ-free mice are colonized with microbiota from human subjects with or without IBS. We found that only mice colonized with IBS microbiota exhibited intestinal changes reminiscent of those found in the donor IBS patients (alterations in motility, secretion and innate immunity). When we colonized mice with microbiota from patients with anxiety, anxiety-like behaviour was observed in recipient mice and this was accompanied by changes in gene expression in the domains of innate immunity and neurotransmission. These findings strongly suggest that the microbiota contributes to the expression of both the intestinal and behavioural manifestations of IBS and prompt consideration of microbiota-directed therapies for this condition. In a placebo-controlled pilot study, we next tested the efficacy of a bacterium, shown in our animal work to be anxiolytic, in IBS patients with co-morbid depression and found a significant improvement in mood that was accompanied by alterations in fMRI monitored brain activity. Our on-going work examines molecular mechanisms underlying microbiota-to-brain communications in the Farncombe Institute.

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. We have completed manuscripts for publication in areas of CMT. Specifically, we are addressing, by retrospective review of our CMT database, whether CMT patients who self-select an active lifestyle with regular exercise preserve strength to a greater extent compared to CMT patients who are relatively sedentary. Additionally, we are examining whether a home-based series of balance exercises in CMT patients can improve both static and dynamic balance. Finally, we are measuring strength differences between CMT1 and CMT2.

Chronic inflammatory demyelinating polyneuropathy (CIDP) continues to be a focus for the Peripheral Nerve Clinic (PNC). I am collaborating with Dr. E. Mathey from the University of Sydney, Australia investigating novel antibodies that are proving to be pathogenic (i.e., NF-186, NF-155, CNTN1). A manuscript is being submitted to the Journal of Neuroimmunology wherein 2 of the 3 anti-CNTN1 patients came from my PNC. This work is contributing to the eventual development of antibody arrays which will facilitate the diagnosis and treatment of CIDP. Dr. Adrian Opala, a PGY5 resident working under my supervision, has analyzed the effects of IV Ig 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.

I continue to participate as a panelist of the Canadian Working Group Consensus update on prevention and management of statin adverse effects and intolerance led by Dr. John Mancini from UBC. Dr. Robert Rosenson provided an invitation to contribute to a recent international forum on statin intolerance as a muscle expert. I have also found clinically that vascular endothelial growth factor receptor 2 may be an earlier serological marker for the devastating disorder called POEMS as opposed to the traditionally measured VEGF levels. I have also identified another seropositive case of anti-glycine receptor positive PERM (progressive encephalomyelitis rigidity and myoclonus syndrome). Dr. Saleem Mahammad, PhD, is writing up these reports in collaboration with Dr. Pierre Bourque from the University of Ottawa who has three cases. This will be the largest case series of PERM reported in Canada.

Collaborations with Dr. Matthew Miller regarding novel compound heterozygous mutations in distinct genes that have DNA helicase activity and are likely to have manifested as a congenital demyelinating neuropathy are being planned. Additionally, Dr. Gianni Parise and I will address the effects of statins on skeletal muscle satellite cell function.

I am also collaborating with Octapharma as a major Canadian site Principle Investigator investigating clinical effects and tolerance of a novel Ig product in patients with chronic inflammatory demyelinating polyneuropathy (CIDP) and multifocal motor neuropathy (MMN).
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. Alfonso Iorio, Kerstin De Wit, Menaka Pai, Vinai Bhagirath, Paul Kim, Deborah Siegal, and Colin Kretz. In addition, Dr. Noel Chan from Australia will be joining us in February 2017. 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 patients-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 from the Faculty of Health Sciences over the past five years.

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 and Dr. Yusuf supports and facilitates the research of several of them through the chair and a range of other funds.

Highlights include:
1. President, World Heart Federation, 2014-2016
3. Honorary Doctorate, University of Gothenburg, Sweden, October 2015
5. Distinguished University Professor Award, McMaster University, June 2016

Research led by Dr. Salim Yusuf found many people in the world who need essential heart medicine do not get it, even in wealthy countries. He suggested a radical shift is required in how such medicines are provided and how preventive care is organized in health care systems.
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. 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 genetics 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:

**Theme 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, Aboriginal people, and women.

**Theme 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 study funded by the Canadian Partnership Against Cancer and the Heart and Stroke Foundation. This study has recruited > 8,000 adults from across Canada to understand the community and individual level determinants of cardiovascular disease and cancer and includes 9 First Nations Communities.

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Dr. Steinberg’s research studies the fundamental mechanisms regulating energy metabolism and how this can contribute to common chronic diseases including type 2 diabetes, cardiovascular disease and cancer.

Highlights in 2015-16 that were supported by the endowed chair include the discovery that adipose tissue AMP-activated protein kinase (AMPK) is vital for maintaining mitochondrial function in brown adipose tissue; findings which may have important implications for the treatment of obesity, type 2 diabetes and non-alcoholic fatty liver disease. His work also identified how high-intensity exercise training lowers blood glucose in mice with pre-diabetes. Lastly, his laboratory discovered that a recently approved type 2 diabetes medication inhibits the growth of prostate and lung cancer cells by inhibiting mitochondrial respiration and glucose uptake.

These discoveries will spur further evaluation of these findings in clinical populations and may lead to new therapies for treating type 2 diabetes, non-alcoholic fatty liver disease and cancer.
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).

Two ongoing CIHR-funded diagnostic studies 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 study is determining if one of the new and very convenient anticoagulant drugs is an effective way to treat superficial vein thrombosis.

Dr. Kearon and the Ontario Clinical Oncology Group are responsible for study design and data management in a NIH-funded trial that is evaluating catheter-based thrombus removal for prevention of the “post-thrombotic syndrome” after DVT. The same network of Canadian and US investigators is planning studies to evaluate catheter-based treatments for established post-thrombotic syndrome and for prevention of long-term complications after PE.

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.

Dr. Donald M. Arnold is the inaugural chair holder of the John G. Kelton Chair in Translational Research, and director of the McMaster Centre for Transfusion Research. Dr. Arnold’s research is on immune-mediated platelet disorders and optimal use of blood products for transfusion.

The focus of Dr. Arnold’s research is primary immune thrombocytopenia (ITP), a common acquired bleeding disorder characterized by low platelet counts and bleeding. The overall goal of his research program is to combine basic and clinical studies in order to bring scientific discoveries from the laboratory directly to the clinic.

His research group is working on identifying a reliable diagnostic test for ITP to fill a fundamental gap in knowledge and improve current management algorithms. This work includes identifying novel targets for the ITP autoantibody and investigating the role of immune cells in the development of thrombocytopenia. Dr. Arnold’s research group has developed a human, autologous model to study megakaryocytes, the platelet-precursor cell in the bone marrow, to understand platelet biogenesis in health and disease. Ultimately, this research will allow for more targeted treatments tailored to individual patients. Dr. Arnold’s group is leading multicentre randomized trials in ITP therapeutics, and has developed the McMaster ITP Registry to understand the clinical, biochemical and genetic features of the disease. This year, Dr. Arnold’s group led a multinational clinical trial on age of red blood cell transfusions, which was published in the New England Journal of Medicine; and a clinical study on the use of platelet transfusions in critically ill patients, published in Chest. His research is funded by Canadian Institutes of Health Research, Canadian Blood Services, the Ontario Ministry of Health and Health Canada.
This Chair was inaugurated in 2016, with Dr. Walker as the first recipient. Dr. Walker has been involved with bone marrow transplantation (BMT) since this procedure was adopted worldwide in the early 1980’s. He has been the Medical Director of the Hamilton program since 1994, and has served the Canadian Blood and Marrow Transplant Group (CBMTG) as chair of its Strategic Planning Committee, and as its President. National and international collaboration is critical to the development of this procedure, and the Hamilton group has reported its activities annually to the Center for International Bone Marrow Transplant Research even though this is not compulsory for Canadian programs.

Bone marrow transplantation is a regulated procedure requiring Health Canada licensing and because of its complex and high-risk aspects Hamilton worked also towards attaining voluntary accreditation from the Foundation for Accreditation of Cellular Therapy (FACT), one of the first Canadian Centres to attain this endorsement of its clinical standards.

The Hamilton group has made a number of significant contributions to the field. It published early papers describing polymyositis as a manifestation of chronic graft versus host disease and donor lymphocyte infusions to reverse leukemic relapse occurring after transplantation, was the first Canadian centre to successfully perform a transplant using an unrelated donor, and initiated the widespread use in Ontario of haploidentical (half matched) donors which provides for virtually all recipients who do not have matched donors.

In 2010, Dr. Walker was successful in securing a CIHR grant to study antithymocyte globulin for prevention of chronic graft versus host disease, the most prevalent and serious complication in recipients surviving beyond two years. This national and international randomized trial was successful and was published in Lancet Oncology in 2016. Subsequently, Dr. Walker was invited to speak at the European conference on transplantation (EBMT) and at Hematology in China. He will speak again on this topic in 2017 as an invited speaker at CBMTG.

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Dr. Mark Crowther

Dr. Crowther is currently Chair and Professor in the Department of Pathology and Molecular Medicine and a Professor in the Department of Medicine. He also holds the positions of Chair, Research Advisory Committee, the Heart and Stroke Foundation of Ontario; President, The Anticoagulation Forum; Chair, Scientific and Standardization Subcommittee on Control of Anticoagulation, The International Society on Thrombosis and Haemostasis; and Chair, American Society of Hematology’s (ASH) Quality Committee (he also oversees ASH’s guideline development program).

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 and porphyria. He is principal investigator on a Heart and Stroke Foundation of Canada-funded project examining whether rivaroxaban reduces the risk of recurrent thrombosis in patients with antiphospholipid antibodies.

Dr. Crowther has 430 peer-reviewed publications with an H-factor of 93, and more than 560 invited national and international speaking opportunities. Dr. Crowther was one of 17 McMaster faculty (and one of 18 researchers in Canada) identified by the Clarivate Analytics 2016 list of the most highly cited researchers.

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LEO PHARMA CHAIR IN THROMBOEMBOLISM RESEARCH

Dr. Mark Crowther
Dr. Ashkan 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. In particular, he is interested in elucidating the impact of subclinical neuroimaging markers of CSVD, such as cerebral microbleeds, on vascular cognitive and functional impairment, as well as the potential for these markers to predict future clinical outcomes and guide therapeutic decisions in stroke patients. 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 research has entailed characterizing the neuropathology of cerebral microbleeds visualized on magnetic resonance imaging and validating the predictive value of the Boston Criteria for cerebral amyloid angiopathy (CAA) in both hospital and population-based cohorts. Additionally, his work has demonstrated an inverse relationship and distinct apolipoprotein E genetic correlates between cortical superficial siderosis and cerebral microbleed in patients with advanced CAA. His findings suggest that cortical superficial siderosis may arise from vasculopathic mechanisms that are fundamentally different from those causing CAA-related microbleeding. This work was further developed to propose the existence of distinct CAA phenotypes. His research within the Framingham Heart Study has demonstrated the possibility of differing inflammatory pathways in the pathophysiology of ischemic and hemorrhagic markers of CSVD. Furthermore, Dr. Shoamanesh conducted the first systematic review establishing an association between cerebral microbleed burden on pre-treatment MRI and post-thrombolysis symptomatic intracerebral hemorrhage and took a leading role in a recent meta-analysis confirming the therapeutic effect of antiplatelet therapy for secondary stroke prevention following lacunar strokes. 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 (NASCAP-IICH) randomized controlled trial assessing optimal antithrombotic therapy in patients with atrial fibrillation and previous intracerebral hemorrhage at recruitment sites across Canada. 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.

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 2015-2016 to support research activities associated with this Chair comes from CIHR (one CIHR Project grant awarded during this reporting period), the National Institutes of Health (USA), the Immune Tolerance Network (USA), Adiga Life Sciences Inc. and the Scleroderma Society of Ontario (SSO). 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 and Dr. Mark Inman; NIH),
2. mechanisms of peptide-induced immune tolerance (with Dr. Elena Tonti; NIH; Adiga Life Sciences),
3. the development of novel allergen challenge models (together with Dr. Helen Neighbour; AllerGen NCE, Immune Tolerance Network),
4. the pathogenesis and treatment of scleroderma (systemic sclerosis) with the Hamilton Scleroderma Group; SSO),
5. development of peptide immunotherapy for peanut allergy (together with Dr. Manel Jordana, Elizabeth Simms and Dr. Susan Waserman)
6. pathogenesis and treatment of rheumatoid arthritis (with Dr. Maggie Larché, Dr. Derek Haaland & Dr. Elena Tonti; CIHR, Michael G DeGroote Fellowship, Adiga Life Sciences).

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 Division of Gastroenterology, the McMaster Immunology Research Centre within the Department of Pathology & Molecular Medicine, and the Department of Chemical Engineering at McMaster University.
Dr. Deborah Cook

Since the inception of the Canadian Critical Care Trials Group in 1989, Hamilton has been a hub of activity for clinical investigations relevant to the care of critically ill patients. Research capacity has grown considerably in the city recently, particularly at the Juravinski Hospital (with the teamwork of Drs. Rochwerg and Karachi). Each ICU at Hamilton Health Sciences (the General and Juravinski sites) and St. Joseph’s Healthcare are actively enrolling patients into observational studies (quantitative and qualitative) and randomized trials, and are engaging patients, families and clinicians in audits and surveys.

In addition to the diverse methodologies characterizing this science, clinical research in our ICUs is done in collaboration with, or led by, physiotherapists, nurses, pharmacists, and surgeons. We are fortunate to have some very experienced Research Coordinators in our midst, and several formally trained critical care research methodologists in junior faculty roles or current or future clinical scholar roles (Drs. Alhazzani, Rochwerg, Ozkowitz, Belley-Côté, and Duan). Our investigations are also heavily contributed to, if not led by, students, residents and research trainees. Fostering the academic experience of young investigators has been central to clinical research in Hamilton for many years since the days of Dr. Sackett, and the ICU faculty continue this mission.

Examples of some recent peer-review studies in our ICUs follow.

Randomized trials have tested the effect of resuscitation with balanced fluid solutions on mortality and renal failure (an individual patient RCT - FLUID), and cluster-cross-over RCT - FLUID), the influence of probiotics on infections (PROSPECT), and the impact of acid suppression on bleeding and infections (REVISE). In terms of advance life support which are the mainstay of so much critical care treatment, we have been evaluating the impact of dialysis timing on renal recovery (STAAART-AKI), and the consequences different approaches to weaning from mechanical ventilation (FAST and SENIOR). The repercussions of in-bed cycling on physical recovery (CYCLE) is also an inter-professionally relevant field of inquiry. Renewed interest in thanatology has prompted studies about the scientific parameters of the dying process and timing of death (DEPART), as well as patient and family-centered dignity-conserving care (D Wishes). A robust new national research program of great public importance led by Dr. Meade is focusing on the processes of care and outcomes of organ donation (DONATE).

Dr. Mark Loeb

Dr. Loeb continues to focus his research on influenza and dengue. His research includes understanding how influenza virus is transmitted through communities and the effect of vaccination.

Dr. Loeb was the awarded an $8 million Foundation grant from CIHR to continue investigations into the effect of repeat influenza vaccination in the Hutterite community, using prospective data collection and banked specimens. He also began a randomized controlled trial in the Hutterite community to compare adjuvanted vaccine to inactivated vaccine. Findings from his previous trial of live attenuated vaccine versus inactivated vaccine were presented internationally and published. They received substantial media attention, including articles in the Wall Street Journal and on National Public Radio in the U.S.

He continues to conduct a trial funded by Joint Global Health Trials competition of UK MRC Wellcome Trust to assess whether inactivated vaccine can reduce adverse vascular events. A randomized trial of 1,300 children in Vietnam comparing vitamin D to placebo to reduce respiratory tract infections was completed and is awaiting publication. Secondary questions using these data are being assessed.

Work as Taskforce Lead of the WHO Working Group on Pregnancy and Influenza has been completed. Dr. Loeb continued to lead a large NIH study to assess genetic variants associated with severe dengue infection. Analyses are being finalized. Dr. Loeb continues in his role as Chair of the Data Safety and Monitoring Board of an important NIH vaccine trial on influenza H7N9 which was first reported to infect humans in March 2013.

Dr. Mukul Shama

Established in 2003 with a generous gift from Mr. Michael G. DeGroote and subsequently converted to a Chair with funds from the Department of Medicine, the goal of the Michael G. DeGroote Chair in Stroke Prevention is to contribute significantly to the body of scholarship in the area of stroke prevention.

Significant progress has been made in the field of stroke prevention with a meaningful decrease in the probability of stroke in those at highest risk. We have identified that a significant number of strokes occur without a dramatic outward presentation but results in cognitive and motor decline leading to dementia, functional impairment and death. These strokes, termed covert strokes occur at five times the frequency of clinically apparent strokes and represent an unaddressed burden of vascular disease in the brain. They are identified on MRI imaging but trials have not yet identified therapies to reduce the occurrence of these strokes. Beginning with my arrival in
2013, we have embedded 2 large MRI substudies in large trials examining medications to prevent stroke. These studies called COMPASS MIND and NAVIGATE ESUS MIND, involving over 200 centers internationally, are in process at present and will be completed over the next 2 years. They have the potential to identify treatments to halt covert vascular brain damage and prevent the related human and societal consequences. These studies have elevated McMaster into the spotlight as developing innovative approaches to the prevention of stroke and dementia.

The last 4 years have seen large shifts in our paradigms for stroke prevention that have required significant redesign of our systems and care pathways. I have assumed the leadership of the McMaster Stroke group and we have developed an integrated approach to combined stroke prevention and research efforts that has significantly improved timelines for care in the prevention clinic and has set an example for other centers. I have devoted significant effort to establishing an infrastructure for clinical research which has led to the development of an integrated system of coordination and finance for our group. This system has significantly improved the scope and effectiveness of clinical stroke research at McMaster.

I am the Chair of the national professional organization for stroke physicians: the Canadian Stroke Consortium. We have created a national course to train neurologists in stroke care and through a partnership with the Canadian Partnerships for Stroke Recovery, initiated a process to increase the density and effectiveness of clinical research capacity in Canada. This system will increase our ability to translate our ideas into effective treatments.

Our research, clinical care and leadership initiatives have propelled McMaster to recognition as one of the leading stroke centers in the world.

Dr. Sahlas has continued to promote inter-professional collaboration with respect to quality improvement research in stroke prevention and carotid revascularization pathways. Interdisciplinary projects have involved improvement in access to stroke prevention clinics by eliminating conventional triaging of referrals, screening for cognitive impairment, and implementation of best practice guidelines for admission of transient ischemic attacks. Additional research evaluating differences in the management of carotid artery disease in cases of near occlusion will serve as pilot data for an upcoming multicenter clinical trial.

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.

Dr. Paul O’Byrne has had a longstanding research interest into the causes and treatment of asthma. In particular, his research is focused on the roles of environmental allergens in causing airway inflammatory responses and the associated changes in physiological responses of the airways, which are a hallmark of asthma.

These studies have demonstrated mechanisms by which the airways signal the bone marrow to increase production of eosinophils and dendritic cells, which then traffic into the airway to participate in allergen-induced responses. Eosinophils and other airway cells, including mast cells, release a group of mediators known as cysteinyl leukotrienes, which Dr. O’Byrne’s research group has demonstrated to be critical mediators for a number of allergen-induced responses including bronchoconstriction, the further influx of inflammatory cells, and the trafficking of dendritic cells, which are the professional antigen-presenting cells in the airways. In addition to this, Dr. O’Byrne’s laboratory has used the clinical models of allergen-induced airway responses and airway inflammation as a mechanism to study the potential efficacy of new drugs in asthma, as well as the mechanisms by which established drugs work.

These studies include the first documented evidence of anti-sense treatment to inhibit the production of cytokine receptors which was shown to be beneficial in this clinical model. Other studies have focused on humanized monoclonal antibodies directed against a number of cytokines thought to be possible mediators of allergic inflammation. This included the first study with an anti-IL-5 monoclonal antibody to show benefit in severe asthma. Finally, research in his laboratory has identified a pivotal role for Th2 cytokines such as IL-4, IL-5, IL-13 and TSLP in inducing airway responses and a possible role for interferon-γ in inhibiting allergen-induced airway inflammation.
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. Some of these activities include his role as an international PI and leader of: a) the 10,000 person REWIND trial of a GLP-1 analog on serious health outcomes in people with diabetes; b) a proteomic and (together with Dr. Pare) genomic analysis of 8000 participants followed for up to 9 years in his ORIGIN trial and ORIGINALE follow-up study, that is identifying novel mechanisms and cardiovascular risk factors in people with dysglycemia; and c) ongoing analyses of epidemiologic and genetic data from the NIH-funded 10,000 person ACCORD passive follow-up study of the short and long-term role of glucose, blood pressure and lipid management in people with type 2 diabetes. He is also directing 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.

Dr. Gerstein recently designed and is co-leading 3 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 cancer, cognitive decline, and cardiovascular diseases. Dr. Gerstein’s research is currently funded by CIHR and industry, and his clinical research is conducted through the Population Health Research Institute, where he is Deputy Director.

During the 2015-2016 academic year, Dr. Gerstein published more than 26 articles and editorials in major peer-reviewed journals; produced and released a widely-viewed novel music video to destigmatize diabetes for patients and their families; was interviewed by various national and international news outlets; and presented data and perspectives as an invited guest speaker, commentator or faculty member at more than 20 national and international meetings.

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The Salim Yusuf Chair in Cardiology supports the activities of the Director of the Division of Cardiology at McMaster University, currently Dr. P.J. Devereaux. The divisional educational and research activities are covered in the Cardiology Division report. This report will focus on divisional clinical activities.

**Clinical Activities:**

As of January 1, 2016 the Saint Joseph Healthcare (SJH) cardiology service split into two services, with one cardiologist providing inpatient clinical care and one cardiologist covering all the diagnostic testing. This change in practice doubled the amount of weeks that required coverage at SJH. I want to thank all the cardiology staff at SJH (i.e., Drs. Allan Kitching, Javier Ganame, Sebastian Ribas, Fred Spencer, Hugh Sullivan, Vikas Tandon, and Chuck Tomlinson) for making this change possible and for the extra weeks of work they are taking on to facilitate this change. I want to thank Drs. Craig Ainsworth, Hisham Dokainish, Omid Salehian, and Koon Teo for helping out to cover some weeks of service at SJH during this transition period.

Our echocardiography program at the Hamilton Health Sciences (HHSC) and SJH successfully obtained accreditation from the Cardiac Care Network (CCN) of Ontario. Dr. Guy Amit initiated our laser lead extraction program. Dr. Jeff Healey initiated the subcutaneous implantable cardiac defibrillator (ICD) program. The interventional cardiology program continued to experience success in building an integrated program with the Niagara cardiac catheterization laboratory. An important achievement this year was establishing a systematic same day discharge process for outpatients undergoing percutaneous coronary intervention (PCI) and same day reperfusion after PCI for inpatients at both the Hamilton and Niagara laboratories. Dr. Shamir Mehta has initiated the mitral valve clip program. Under the leadership of Drs. Madhu Natarajan and James Velianou, our transcatheter aortic valve replacement (TAVR) program continues to grow. Under the leadership of Dr. Craig Ainsworth, the Hamilton General Hospital Cardiac Care Unit (CCU) expanded its scope of care and now manages all patients after any percutaneous structural heart procedure. Under the leadership of Drs. Taj Sheh and Vikas Tandon, our cardiac CT angiography program has grown and is now used to size the aortic valve annulus in patients undergoing TAVR to avoid the need for transesophageal echocardiography in frail elderly patients and facilitate valve implantation during the procedure. At the Juravinski Hospital and Cancer Centre, Dr. Darryl Leong has worked with oncology to initiate our cardiac-oncology clinical program. Under the new leadership of Dr. Eva Lonn, our cardiac rehabilitation program made substantial gains in shortening the time from referral to commencing the program (i.e., the time period is now 2-3 weeks). We undertook an external review of our Heart Failure Program. Dr. Hisham Dokainish has taken over the leadership of this program, and we have now improved from a ~3 month delay to no waiting period to get into the Heart Failure Clinic.

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**ST. PETER’S / MCMASTER CHAIR IN AGING**

Dr. Sharon Marr

The Chair’s focus and desire has been to develop evidence-based interprofessional geriatric-based educational programs and to improve human resources and training in academic health care centres and underserviced communities. Dr. Marr has supported novel and creative approaches to patient care and system coordination, education, and research through collaboration and inter-professional partnerships nationally and internationally. The Chair has proudly continued to support many projects such as the Geriatric Certificate Program with over 500 clinicians registered and more than 100 graduates; AGE-ON (six-week education program striving to teach older adults how to confidently use technology to improve their use of the internet, attitudes towards computers, health literacy and perceived social isolation); and the 2015 Update in Geriatrics Education Day and Life Long Achievement Award. The 2015 award recipient was Ms. Suzanne Labarge, McMaster University Chancellor who has contributed in numerous ways to the study of optimal aging to improve the quality of life of our community’s aging population.

The Chair has also supported the Internal Medicine Dr. Christopher Patterson Award for Excellence in Geriatric Research Grant in Seniors’ Care (up to $5000). For the academic year 2015, Dr. Eric Wong was awarded this grant for his qualitative study on delirium assessment on a surgical ward. In addition, Dr. Marr has supported Dr. George Ioannidis (Associate Director at GERAS), Dr. Justin Lee (Geriatrician, Clinician Investigator with a background in clinical pharmacology in the Health Research Methods Program at McMaster University), and Dr. Mimi Wang (Geriatrician, Clinical Scholar in the Masters of Education Degree Program).

**Acknowledgement:**

It has been an honour and privilege for the Chair to be supported, mentored and guided by following: St. Peter’s Hospital Foundation/Hamilton Health Sciences, Dr. John Kelton, Dr. Paul D’Byrne, the Department of Medicine Administration, FHS McMaster University, Mrs. Kevin Sulewski, Estate of Lindsay Thompson, Ms. Sharon Pierson, Dr. A. Papaioannou, Mr. Ryan Liddell, Ms. Lynn Pacheco, Ms. Lily Consoli, Ms. Aisha Patel, and Mr. David Jewell.
ENDOWED CHAIRS

WILLIAM J. WALSH CHAIR IN MEDICAL EDUCATION
Dr. Ameen Patel

I would like to extend my continued thanks and appreciation to the DeGroote family for their generous donation in establishing this Chair. It is an honour for me to hold this Chair and the support has allowed me to advance clinical and education scholarship.

In the 2015-2016 academic year, I contributed to education administration as the Deputy GIM Division Director, Juravinski Hospital Clinical Teaching Unit Director, Postgraduate PGY4 Internal Medicine Program Director, and Department of Medicine Associate Chair of Education. In these roles, I have had the opportunity to contribute to the development and implementation of curricular and advancement of faculty evaluation. As the Associate Chair of Education, I have enhanced the communication with local part-time faculty and the distributed campuses through more regular visits and follow-up meetings with all new part-time recruits. I have also established a regular schedule of follow-up meetings with all new full-time faculty recruits to review their scholarship initiatives and to assist in the introduction, implementation and evaluation of scholarship opportunities. The Department of Medicine traditionally has the largest number of recruits going forward for reappointment and promotion. I am responsible for the independent education review for all these candidates.

I continue to play a role on the national level through my activities with the Royal College of Physicians and Surgeons of Canada, the Canadian Society of Internal Medicine and the Ontario Chapter of the American College of Physicians. In these roles, I have had a positive impact on knowledge dissemination, policy statements and national specialty certification. More recently, I have taken on the role as the liaison between the Canadian Society of Internal Medicine and the Canadian Journal of General Internal Medicine. In this role, I have been successful in recruiting a new Senior Editor, establishing publication of symposia research abstracts, contributed to the development of an online version of the journal, contributed to the successful indexing in Thomson Reuters Web of Science Emerging Sources Citation Index and am awaiting an indexing decision from the National Library of Congress.

I was part of a McMaster group reviewing non Royal College Certified Clinical Fellowships. The goal of this committee is to establish department wide accepted protocols for recruitment, funding, orientation, education goals and objectives and evaluation. This is being done as part of a postgraduate initiative, which includes other clinical departments.

I had four peer reviewed publications. I am a named member on several grants and currently a site PI for two major international trials. I supervise several medical students and postgraduate trainees in quality improvement projects. My trainees have had good success in presenting their research at peer-reviewed conferences (Canadian Society of Internal Medicine Annual Meeting and the International Conference on Residency Education) and in publishing the work in peer-reviewed journals.

WILLIAM J. WALSH CHAIR IN MEDICINE
Dr. Judah Denburg

In February 2016, Dr. Denburg received the William J. Walsh endowed Chair in Medicine. He 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 decade, Dr. Denburg has forged a strong national research and training community in allergic disease, uniting academics, researchers and students from 46 disciplines and 21 universities and hospitals in multi-sectoral partnered teams, now with international connections and visibility in several continents. The 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.
In April 2011, Dr. Anand received the Canada Research Chair in Ethnic Diversity and Cardiovascular Disease. 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 cardiometabolic 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.

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 centers 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 7 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, bedside nurses, other clinicians, the intensivist team (Drs. Rudkowski, Alhazzani, Jaeschke, Ligor, Duan, Soth and myself) and our palliative care colleagues (Drs. Boyle and 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 awkwardly 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.

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 2015-2016 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, peanut allergy, rheumatoid arthritis, scleroderma, transplant rejection (graft versus host disease), and autoimmune thrombocytopenia. Funding has come from the National Institutes of Health (USA), Immune Tolerance Network (USA), Scleroderma Society of Ontario, and Adiga Life Sciences Inc. During the 2015-16 period, a 3-year CIHR Project grant was awarded focusing on the development of a therapeutic vaccine for rheumatoid arthritis.

Dr. Larché continues to develop and evaluate peptide therapies for allergic disease in close collaboration with Adiga Life Sciences, a joint venture between McMaster and UK-based Circassia Pharmaceuticals PLC. Circassia is currently conducting clinical trials of peptide-based therapies for house dust mite allergy and cat allergy. The results will inform design of future interventions and may identify biomarkers of efficacy. Further therapies are under development for birch tree pollen allergy, Japanese Cedar allergy and mould allergy.

Dr. Larché’s group continues active collaborations 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, Respiratory and Hematology), and the Department of Chemical Engineering.

Dr. Gregory Steinberg

Dr. Steinberg’s research studies the fundamental mechanisms regulating energy metabolism.

Over the last several years an important focus in the Steinberg laboratory and the Metabolism and Childhood (MAC)-Obesity Research Group has been brown adipose tissue. Brown adipose tissue is an organ which has the unique capability, compared to any other organ in the body, to burn large amounts of sugar and fat and effectively dissipate this energy as heat. While brown adipose tissue is frequently considered the body’s furnace, unfortunately, in individuals with obesity or diabetes the ability to switch on brown adipose tissue is compromised. Dr. Steinberg’s research group has discovered that reductions in adipose tissue AMP-activated protein (AMPK), which occurs in people with obesity and type 2 diabetes, contributes to impaired brown adipose tissue mitochondrial function and thermogenesis. This impaired brown adipose tissue function makes mice more susceptible to developing pre-diabetes and non-alcoholic fatty liver disease (NAFLD). These data suggest that therapies aimed at restoring this metabolic switch may be an effective means to treat obesity, type 2 diabetes and NAFLD.

High-intensity interval exercise training improves liver insulin sensitivity without altering lipid content or fibrosis in obese mice.


Steinberg, Marcinko lab
Another important development was the discovery, with Dr. Hardie from Scotland, that the recently approved diabetes medication Canagliflozin could dramatically suppress the synthesis of lipids in liver cells. Remarkably, this drug also dramatically slowed the growth of lung and prostate cancer cells by inhibiting their mitochondrial respiration and ability to take up glucose. These data indicate that in addition to lowering blood glucose this medication may also be effective in treating NAFLD and preventing adenocarcinomas of the lung and prostate.

Lastly, an important area of study for the lab continues to involve understanding the molecular mechanisms by which exercise exerts health benefits. This year, the Steinberg lab discovered that high-intensity exercise training (HIT) lowers blood glucose by improving liver and adipose tissue insulin sensitivity. They also discovered that pharmacological activation of the AMPK signaling pathway in muscle (which occurs during exercise) improves insulin sensitivity and exercise capacity. These findings have important implications for improving glucose control and potentially exercise capacity in patients with type 2 diabetes.

The human body is host to numerous complex microbial communities that comprise the human microbiome. These microbes and their dynamic interactions within these communities, and with the host, play critical roles in human development and health. Although considered primarily beneficial, bacteria within the microbiome also contribute to disease. The human microbiome is a reservoir of potential pathogens and antibiotic resistance genes, specific interactions of seemingly benign commensal organisms with pathogens in polymicrobial infections can enhance virulence, and changes in the composition of the microbiome (dysbiosis) contribute to chronic inflammatory disease.

Dr. Surette has established a broad research program addressing the mechanisms of by which the microbiota contribute to health and disease. This work is focused primarily on the respiratory and gastrointestinal tracts, and his lab has expertise on developing culture-independent and culture based approaches to characterize and exploit the microbiome.

Specific projects investigating cystic fibrosis respiratory infections, asthma, allergy, pneumonia, sepsis, ulcerative colitis, irritable bowel syndrome, metabolic syndrome, and influence of the microbiome on psychological disorders. Additional research is focused in characterizing the development of the microbiome in infants and changes that occur with aging.

During the reporting period the Surette lab contributed 23 papers, was the recipient of a CIHR project grant, and co-investigator on 4 new CIHR team grants. His research is also supported by operating grants from Cystic Fibrosis Canada and Crohn’s and Colitis Canada. In addition to his research program, Dr. Surette is co-director of the McMaster Genome Center.
Dr. Eva Szabo started as an assistant professor in 2013 in McMaster University's Departments of Medicine & Biochemistry and Biomedical Sciences. Dr. Szabo's research laboratory is located within the Stem Cell and Cancer Research Institute (SCCRI), a shared facility that allows utilization of cutting-edge technologies along with vast human stem cell expertise to ask questions about how human stem cells are regulated in a healthy versus diseased setting. Dr. Szabo's prior research demonstrated the role of Wnt and calcium signaling in human hematopoietic and adipocyte development from embryonic (ESCs) and induced pluripotent stem cells (iPSCs). Furthermore, her work on reprogramming of adult somatic cells towards iPSCs provided pioneering work for the field of directed reprogramming by demonstrating that adult cells can be directly converted to functional blood, neural progenitor and adipocytes bypassing the need for a pluripotent state.

Her current research focuses on understanding how human stem cells and metabolic shifts regulate development of obesity and type 2 diabetes (T2D) and downstream complication such as peripheral neuropathy and coronary artery disease (CAD). Accordingly, Dr. Szabo's program has three main avenues of research that are supported by CIHR, 2014 Maud Menten New Principal Investigator Prize (clinical stream), Brain Canada Platform Support Grant, Canada Foundation for Innovation (CFI) fund and Early Research Award (ERA) Round 11 which include:

1. modeling human adipocyte development in an obese and healthy setting by utilizing patient specific adipose tissue derived stem cells (ADSCs), where her group show that there are clear differences between the stem cells of healthy versus obese patients in regards to insulin responses and glucose and fatty acid processing, as well as mitochondrial biogenesis and function; The understanding of these differences between healthy versus obese ADSCs allowed her group to develop a functional high throughput drug-screening platforms that allow the read out of multiple functional parameters in a single plate towards identification of novel compounds that alter lipid accumulation, insulin sensitivity and mitochondrial function in adipocytes;

2. to understand the underlying molecular mechanism that cause obesity and T2D-induced neuropathy by using patient specific iPSC derived peripheral nerves and to identify drugs that can prevent damage or allow regeneration of peripheral neurons following metabolic insult;

3. to determine how rare pathogenic genetic variants cause early onset of coronary artery disease (EOCAD) in individuals under the age of 45 using patient specific iPSC derived endothelial and hematopoietic cells.

Therefore, the overarching aim of Dr. Szabo's research is to understand the development of obesity and downstream complications, such as T2D and CAD, as well as to establish alternative treatment strategies and biomarker platforms towards alleviating disease burden, allow better clinical diagnosis and improve patients' quality of life.

Dr. Eva Szabo

Dr. Elena F. Verdu

Dr. Verdu has had a long-standing interest in the pathophysiology of inflammatory and functional gastrointestinal disorders, with particular focus on host-microbial and dietary interactions. Her CRC program explores the mechanisms underlying gluten-related disorders, including celiac disease and non-celiac gluten sensitivity, and investigates the potential role of intestinal microbiota as modifier of disease risk.

During 2015-16, Dr. Verdu has published (print or online ahead of print) 13 peer-reviewed papers (8 original papers, including one meta-analysis) in top journals of her field (Gastroenterology, IF:18.18) as well as in general journals (IPNAS, IF:9.4; Science Reports, IF:5.2). Of these, the primary work supported by her CRC tenure includes the discovery that bacteria in the small intestine metabolize gluten differently, to increase or decrease its immunogenicity. This interaction between microbes and gluten could help determine the risk for autoimmune enteropathy in genetically susceptible individuals and may underlie the reported association between dysbiosis and celiac disease. Dr. Verdu's group investigated gluten metabolism by opportunistic pathogens and commensal duodenal bacteria, and characterized the capacity of specific peptides to activate gluten-specific T-cells from patients with celiac disease. They also used probiotic mouse models to study gluten metabolism in vivo. Gluten peptides produced by bacterial metabolism were characterized by liquid chromatography tandem mass spectrometry in collaboration with Dr. Nathan Magarvey, and their immunogenic potential was evaluated using peripheral blood mononuclear cells from patients with celiac disease after a 3-day gluten challenge. They found that Pseudomonas aeruginosa, an opportunistic pathogen isolated from patients with celiac disease, had elastase activity and produced gluten metabolites that were often highly immunogenic to celiac patients, inducing responses as strong as the parent 33-mer. In contrast, Lactobacillus spp. from the duodenum of individuals without celiac disease degraded gluten peptides produced by human and P. aeruginosa proteases, reducing their immunogenicity. The results suggest pathogens such as P. aeruginosa in the small intestine may contribute to development of celiac disease through their pattern of metabolism of gluten.

Dr. Verdu has been invited to present at patient-based organizations, such as the Canadian Celiac Association as well academic centers.
such as the University of Mainz, Germany; NIH workshops at Bethesda, US; Pasteur Institute, Paris and many other national and international meetings.

Dr. Verdu has recently renewed her CRC, and been awarded a CFI, as well as a Visiting Research Professor Award by the Canadian Gastroenterology Association. She continues to be funded by CIHR, CCC and by a combined CIHR/ French National Research Institutes grant, obtained in 2016.

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**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 prompted the successful Canadian Institutes of Health Research Team Grant in Venous Thromboembolism that was awarded to Dr. Weitz and the McMaster Thromboembolism Group in 2006. Providing $4.2 million over seven years, the Team Grant funded new initiatives in thrombosis research that span the spectrum from basic science, to clinical trials, to research in knowledge translation, and created new collaborations at Queen’s University, McGill University, the University of Toronto, and the University of Michigan. These interactions have facilitated successful grant-in-aid applications to the Canadian Institutes of Health Research, the National Institutes of Health and the Heart and Stroke Foundation.

In addition, this Chair was the impetus for the successful $35 million Canadian Foundation for Innovation award for the Large Scale Institutional Endeavor that provided one-third of the funding for the David Braley Research Institute at the Hamilton General Hospital site.

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$35M

**Canadian Foundation for Innovation award for the Large Scale Institutional Endeavor**