Sometimes appearances can be surprisingly deceptive. Yet the choice of multiple arrows heading towards a common destination on the cover of this year's annual report seems to appropriately capture the Canadian VIGOUR Centre's collective energy and direction as we rounded out a remarkable 2016. Knowing that we were heading into our 20th anniversary year since being established as a University of Alberta Research Centre, we decided to undertake a strategic planning exercise in June 2016 to help navigate our way forward. While our vision, mission, and core values remain rock solid [reaffirmed by the compass within this report], we live in what is unmistakably a remarkable and changing time. Hence, we must find a path that not only reflects the evolution of cardiovascular health care but also the research strategies needed to inform its future. Guided by our faculty and senior leadership we have embraced several initiatives to be pursued in the time ahead. These initiatives include: developing new methods to make our clinical trials more efficient and pragmatic; extending our reach in population health and big data; enhancing our efforts at knowledge translation and dissemination through new media tools; defining and communicating our strong legacy of teaching and mentoring more clearly; and growing our key foundational resource i.e. our faculty.

An overarching theme of this exercise is collaboration at every stage. This means vigorously engaging with our University of Alberta, Alberta Health Services, and Alberta Health partners, as well as our other valued colleagues within Alberta, across Canada, and around the world. Perhaps the progress we have made as a Centre over the last two decades is best expressed by the African proverb “If you want to go fast, go alone. If you want to go far, go together.” Trust is foundational to the rich collaborations we are privileged to enjoy. It is also the currency for the relationships we are committed to building, nurturing, and enhancing across the full spectrum of our research endeavors.

In this context, let me specially commend Padma Kaul and Finlay McAlister for their creative efforts at initiating the “Alberta Big Data in Health Meeting” this past September. They assembled a stellar and diverse transdisciplinary group of 29 participants from across the province to explore how the electronic health revolution might contribute to a true “learning health care system”. With the advent of an electronic medical record and the Alberta SPOR network - perhaps facilitated by innovative machine learning - we are uniquely poised to transform “digital exhaust into digital fuel”. We eagerly anticipate progress on this new frontier in health research.

Inspired by the 20th anniversary, we also decided it was time for a new visual expression of our CVC brand, reflecting both our proud history and bold future vision. To garner fresh ideas for a new logo, a University of Alberta visual design class was challenged to come forward with an original concept that would best represent the CVC. As we expected, the students created an array of innovative logo proposals that captured the essence of the CVC, and our team unanimously selected the logo created by Trevor Lau. This logo, located on the front cover page and evident throughout this report, evokes the shape of a heart, an image that is central to our organization’s objectives and identity. This modern design strongly communicates the CVC name as well as our evolving organizational identity. Additionally, the bridging between the letters is well aligned with our mission of Bridging hearts and minds to enhance cardiovascular care.

In concert with our logo, we have launched a new website to provide a more contemporary and comprehensive window into the CVC. This revitalized website is easily accessible, responsive, interactive, and informs users about who we are, our services, clinical research projects, and publications. I wish to acknowledge the creative expertise of Ellen Pyear and her colleagues Carla Price and Oksana Grant in helping to brand and assemble our CVC team’s extraordinary work in 2016 for which the Co-Directors and I are both grateful and proud. We look forward to any comments you have on our annual report as well as welcome any feedback on the website directed to thecvc@ualberta.ca.
“The logo I created for the Canadian VIGOUR Centre was inspired by the idea of simplicity. If the idea is clearly presented, not only can it be understood by a larger audience, but it can also effectively communicate meaning equally, if not more than a complex solution.”

– Trevor Lau, Graphic Design Student, University of Alberta

Introducing the New CVC Visual Identity

In the latter half of 2016, we began the exciting process of reimagining the visual identity of the Canadian VIGOUR Centre. We are thrilled to share the results of the visual transformation of our logo in the above picture, which was inspired by our Centre’s upcoming 20th anniversary in 2017. This newly conceived CVC brand reflects both our organization’s proud history and bold future vision.

Our quest for a new logo began with a collaborative process between the CVC and the Department of Art and Design at the University of Alberta. We challenged a visual design class to create original logo concepts that strongly reflect the identity and future direction of the CVC. The students provided an impressive array of innovative design proposals, from which our leadership team unanimously selected the logo created by Trevor Lau. Trevor’s logo embodies the shape of a heart, an image that is central to our organization’s objectives and identity. The heart is in turn formed by three distinct parts – the letters C, V and C. The modern aesthetic of this design is a powerful visual that strongly communicates the CVC name and our evolving organizational identity. Additionally, the bridging between the letters is well aligned with our mission of Bridging hearts and minds to enhance cardiovascular care.

In addition to the introduction of a new CVC logo, the process of reimagining our visual identity also included the launch of our new website – www.thecvc.ca. We are proud to share the results of this project, which provides viewers with a more contemporary and comprehensive window into the CVC. We encourage you to visit our new website to discover expanded materials that demonstrate our organization’s commitment to innovative and collaborative research that enhances the health of citizens of Alberta, Canada, and the world.
Vision, Mission, and Core Values

**VISION**
Generate, translate and disseminate knowledge on novel diagnostic and therapeutic strategies in cardiovascular medicine acquired through collaborative research.

**CORE VALUES**
- Quality
- Collaboration
- Integrity
- Respect

**PURPOSE**
To enhance cardiovascular health for current and future generations.

**PROMISE**
- Trusted partner
- Effective communicator
- Clinical relevance
- Scientifically robust
- Credible results
- Novel technologies
- System-performance measurement
- Fulfill social contract

**OPERATIONAL PRIORITIES**
- Collaborator and site retention through engagement
- Efficient project management
- Early on the ground
- Maximizing return on investment
- Linking trials/registries/populations
The Value Proposition of an ARO

An academic research organization (ARO) possesses scholarly values of inquiry and truth and shares knowledge in an ethical framework. Dedicated to enhancing public health, it values discovery, novel approaches, and methodologies over profit. Intent upon maximizing the return on research investment, an ARO strives to exceed the operational efficiencies of a clinical research organization (CRO), and intentionally seeks funding from diverse sources beyond industry.

An ARO is almost always embedded in a University and therefore reserves their right to publish their insights with objectivity. An ARO functions on a not for profit basis, and reinvests all sources of capital, both financial and intellectual, into the education of the next generation of health professionals, and thereby aims to fulfill its social contract to promote the public good.
Cycle of Quality

As a learning organization committed to enhancing the health of current and future generations through research, CVC relentlessly pursues the generation, translation, and dissemination of new knowledge addressing unmet clinical needs.

This culture of learning embraces the cycle of quality that begins with health science discovery followed by its application to human disease using careful quantitative and qualitative measures. For discovery to have an impact, its efficacy must be first examined in controlled populations. Subsequently, the effectiveness needs to be evaluated through performance measures in carefully crafted patient registries acquired in selected disease states. To complete this cyclical process there must be successful dissemination of new knowledge into clinical practice resulting in meaningful differences in health outcomes at the population level. Health economic evaluation, demonstrable return on investment, and responsive health policy enrich the success and timeliness of this journey. Professional and public education are seminal components of the process occurring in parallel. The inevitable destination of this construct is a new appreciation for the unmet needs of the population and re-entry into the cycle to continue the quest for improvement in clinical and/or health system outcomes.
2016 by the Numbers

9 Industry-funded studies underway
38 CVC faculty and staff members
332 On-site and remote monitoring visits that occurred in Canada
166 Global users accessing CVC’s online collaborative platform

125 Publications produced by the CVC’s body of research
124 Principal Investigators participating in CVC-managed trials
6,358 Citations generated from 493 CVC-authored papers produced from 2012-2016
2.5 Million Canadians represented in CVC’s data repository

11 Grant-funded projects underway

Geographical location of users accessing the CVC website

Percentage of website views by country

1. Canada 70.29%
2. United States 9.83%
3. United Kingdom 5.16%
4. Russia 2.96%
5. Other 11.76%
## Grants

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Funding Source</th>
<th>Principal Investigator(s)</th>
<th>Years</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing Rapid Out of Hospital Acute Cardiovascular Treatment (PROACT-4)</td>
<td>Heart and Stroke Foundation</td>
<td>Justin Ezekowitz, Paul Armstrong, Padma Kaul, Robert Welsh</td>
<td>2014-2017</td>
<td>$233,000</td>
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<tr>
<td>Gestational Diabetes Mellitus (GDM) in Alberta</td>
<td>Canadian Institutes of Health Research</td>
<td>Padma Kaul (PI)</td>
<td>2014-2017</td>
<td>$278,139</td>
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<td>Exploring the Interplay Between Renal Function and Outcomes in Non-valvular Atrial Fibrillation</td>
<td>Heart and Stroke Foundation</td>
<td>Finlay McAlister (PI)</td>
<td>2015-2017</td>
<td>$136,111</td>
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<td>Risk Estimation Following Infarction Noninvasive Evaluation ICD Efficacy (REFINE ICD) Trial</td>
<td>Medtronic Inc.</td>
<td>Padma Kaul (Co-PI)</td>
<td>2011-2018</td>
<td>$869,972</td>
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<td>SODIUM-HF</td>
<td>Heart and Stroke Foundation</td>
<td>Justin Ezekowitz (PI)</td>
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<td>Vascular Scanning in Family Members of Patients with Premature Vascular Disease (VASSCAN Pilot Study)</td>
<td>Heart and Stroke Foundation</td>
<td>Kevin Bainey (PI)</td>
<td>2015-2017</td>
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<td>SODIUM-HF</td>
<td>Heart and Stroke Foundation</td>
<td>Justin Ezekowitz (PI)</td>
<td>2014-2017</td>
<td>$233,000</td>
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<tr>
<td>Identifying Hospitalized Heart Failure Patients Who Require a Critical Care Admission</td>
<td>University Hospital Foundation</td>
<td>Sean van Diepen (PI), Justin Ezekowitz, Padma Kaul, Finlay McAlister, Cynthia Westerhout</td>
<td>2015-2016</td>
<td>$42,000</td>
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<tr>
<td>Provincilaial and National Costs of Unnecessary Coronary Intensive Care Unit Admissions</td>
<td>University Hospital Foundation</td>
<td>Sean van Diepen (PI)</td>
<td>2016-2018</td>
<td>$35,000</td>
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<td>Alberta COAPT Registry: Alberta Contemporary Acute Coronary Syndrome Patients Invasive Treatment Strategies: Impact on Clinical Outcomes and Health Care Resources</td>
<td>AstraZeneca Canada</td>
<td>Kevin Bainey (PI), Robert Welsh (PI)</td>
<td>2015-2016</td>
<td>$175,000</td>
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</table>
Implications of Ischaemic Area at Risk and Mode of Reperfusion in ST-elevation Myocardial Infarction.


This study investigated the influence of myocardial territory at risk on the choice of reperfusion strategy. It was based on a unique and comprehensive patient population from the Strategic Reperfusion Early After Myocardial Infarction (STREAM) trial randomized to early fibrinolysis versus primary PCI (PPCI). The association between summed baseline ST-segment elevation (STE) or ST-segment deviation (STD) and adverse clinical events has been previously demonstrated by our group. For the first time in this study we have shown similar 30-day and 1-year clinical outcomes with either a pharmacoinvasive strategy or PPCI, irrespective of the extent of baseline STE and/or STD. Thus clinicians should be guided by the overarching need to administer timely reperfusion best suited to individual circumstances in patients presenting early with STEMI. Such insights would never have been possible without the CVC team working in our core ECG laboratory where we have a rich patient library offering unique opportunities for discovery that not only informs the meaning of our work, but assists in planning future directions.

Early Follow-up After a Heart Failure Exacerbation: The Importance of Continuity.

McAlister FA, Youngson E, Kaul P, Ezekowitz JA.

Although early follow-up for heart failure is recommended, the time window in which physicians should do the follow-up is unclear. Because previous studies have focused on a short follow-up within 7 days, we explored whether longer follow-up within 14 days and physician continuity would influence outcomes within 30 days of a heart failure exacerbation. Of 39,249 adults (mean age, 76 years) with an acute heart failure exacerbation in Alberta resulting in an emergency department visit or a hospitalization, 34% had no outpatient visits in the next 14 days, 56% received follow-up from a familiar physician, and 10% saw an unfamiliar physician. Compared with no outpatient follow-up within 14 days, the risk of death or hospitalization within 30 days was lower in patients who saw a familiar physician (adjusted hazard ratio, 0.94; 95% confidence interval, 0.89–0.99); the risk of death or hospitalization or emergency department visit within 30 days was less common with either familiar physician follow-up (adjusted hazard ratio, 0.86; 95% confidence interval, 0.82–0.89) or unfamiliar physician follow-up (adjusted hazard ratio, 0.93; 95% confidence interval, 0.87–0.99). Hence outpatient follow-up within 14 days is associated with better outcomes, and outcomes are best if such follow-up is done by a physician familiar with the patient. This work is a great example of how accessing data from the rich Alberta population database informs how well clinical practice adheres to guidelines, and what lessons can be learned to improve patterns and systems of care in the future.
Do Stable Non-ST-segment Elevation Acute Coronary Syndromes Require Admission to Coronary Care Units?


Current clinical practice guidelines recommend admitting patients with stable non-ST-segment elevation acute coronary syndrome (NSTE ACS) to telemetry units, yet up to two-thirds of patients are admitted to higher-acuity critical care units (CCUs). Using an Alberta population-based data of 7,869 patients hospitalized with NSTE ACS, the outcomes among patients initially admitted to a CCU (n = 5,141) were compared with those admitted to cardiology telemetry wards (n = 2,728). Interestingly, no differences in mortality or 30-day all-cause post-discharge readmissions were observed between patients with NSTE ACS initially admitted to a ward or a CCU. These findings suggest that stable NSTE ACS may be managed appropriately on telemetry wards and presents an interesting opportunity to reduce hospital costs and critical care capacity strain. At this critical time in healthcare resource utilization, it behooves the research community and CVC to explore the value proposition for various elements of cardiovascular care. This work undertaken by Sean van Diepen and colleagues points towards potential efficiencies in our approach to acute coronary disease, which comprises a large element of our system of care.

Alignment of Site Versus Adjudication Committee Based Diagnosis with Patient Outcomes: Insights from the Providing Rapid Out of Hospital Acute Cardiovascular Treatment 3 Trial.


A key resource within CVC are the rich clinical databases that reflect our prior research. These are often a great laboratory for our trainees to explore as they seek to advance their research careers. This study was conducted by Nariman Sepehrvand, a top medical graduate from Iran who is pursuing a graduate degree at the University of Alberta under the supervision of Justin Ezekowitz. He explored the vexing issue of how to assess patient outcomes from clinical trial data acquired from the medical record in 422 cases of patients with presumed acute cardiovascular disease. Essentially, he compared the diagnoses provided by emergency physicians at the front lines with adjudicated decisions by an experienced group of cardiologists. Key findings were that; 1) there was good agreement in the final diagnosis in 88% of cases, 2) when disagreement did occur the patient outcomes in this cohort were worse short and long-term mortality. This finding gives us pause about requiring adjudication oversight on all trials outcomes; they may be best reserved for circumstances where unblended therapy is employed and the potential for bias is prevalent.
Levosimendan in Patients with Left Ventricular Dysfunction Undergoing Cardiac Surgery.


This article was published in early 2017 in the prestigious New England Journal of Medicine in concert with a simultaneous presentation at the American College of Cardiology in Washington D.C. Because it represents the establishment of a new collaborative linkage within the CVC it prompted this fast tracking entry into our 2017 annual report.

This work involved the assessment of a levosimendan novel drug that is known to enhance heart function if it is malfunctioning after heart surgery. This patient population with reduced left ventricular ejection fraction undergoing cardiac surgery with the use of cardiopulmonary bypass has several unmet clinical needs. The CVC has not previously been engaged in their investigation. Thanks to the leadership of Shaun Goodman, ably assisted by Stephen Fremes, a cardiac surgical colleague in Toronto, and Sean van Diepen at the CVC, Canada played a meaningful role recruiting 10 centres in large part based on the efforts of Project Lead Jodi Parrotta, who skillfully quarterbacked our Canadian efforts. Our colleagues at the Duke Clinical Research Institute, namely John Alexander and Raj Mehta led the overall trial.

Levosimendan is a calcium sensitizing inotropic agent with cardioprotective properties that has been reported to prevent and treat low cardiac output in small studies. Additionally, meta-analysis has suggested a potential mortality benefit in patients with reduced ejection fractions; however, high quality evidence to support its routine use in cardiac surgical patients was lacking. While levosimendan is approved for use in heart failure in Europe, it is not available in North America.

The study reported no statistically significant differences in the co-primary composite outcomes of (1) death, renal replacement therapy, peri-operative myocardial infarction, or the use of mechanical assist devices, or (2) death or mechanical assist device use. Levosimendan did, however, increase cardiac output, reduce the incidence of post-operative low cardiac output syndromes by 7.5%, and the use of inotropes beyond 24 hours by 8.8% without an increase in pre-specified safety endpoints or post-operative adverse events. Taken together, this is the first trial of an inotropic therapy in the cardiac surgical population to demonstrate hemodynamic efficacy and safety.

It can be disappointing when a trial does not meet its primary outcome, but there are some signals of efficacy among subgroups (low left ventricular ejection fraction, isolated coronary artery bypass surgery, and reduced glomerular filtration rate) that will certainly merit further investigation in secondary analyses or future trials. There was also a trend towards a reduction in all-cause mortality at 90 days, but the trial was not powered to show such a potential difference. Although a “negative” trial from a statistical standpoint for the primary outcomes, the study will likely be positively received by the clinical community because (1) it is the first trial to provide high quality evidence that an inotrope is both hemodynamically effective and safe in high risk cardiac surgery patients and (2) it may help define future low cardiac output syndrome prevention study populations. This tantalizing clue leaves the door open for more detailed exploration of why this might occur and whether future studies are warranted to explore it.

The CVC is grateful to our outstanding site investigators and study coordinators with whom we have forged new - and hopefully lasting – collaborative investigative relationships. Most importantly, the Canadian patients who volunteered to help advance our understanding of the potential efficacy and safety of levosimendan in cardiac surgery are sincerely appreciated.
2016 Publications


Bainey KR, Norris C, Shavadia J. Response to: Letter to the Editor regarding the manuscript “Symptomatic graft failure and impact on clinical outcome after coronary artery bypass grafting surgery: Results from the Alberta Provincial Project for Outcome Assessment in Cardiovascular Disease Registry”. Am Heart J. 2016;171:a11.


Reflecting the CVC’s global reach and network of collaborators, this summary highlights some of the key international lectures and presentations that were delivered by CVC faculty members in 2016. The CVC’s insights and impact are enhanced by these pursuits of knowledge translation and dissemination.

Paul Armstrong
Toronto, Canada
Canadian Stroke Prevention Intervention Network 2nd Annual Clinical Trials Workshop – January 2016
Reflections on Career Development from a Clinician Investigator

Newark (DE), USA
Christiana Health Care System
Grand Rounds – November 2016
Acute Myocardial Infarction 2016: Reflections of a Clinical Investigator

Chicago, USA
American College of Cardiology (ACC)
65th Annual Scientific Sessions – April 2016
• The Ideal Fibrinolytic Regimen in Contemporary Practice
• Special Session Late Breaking Clinical Trials Deep Dive II (Co-Chair)

Rome, Italy
European Society of Cardiology Congress – August 2016
Newly Emerging Data from the TECOS Cardiovascular Safety Trial: An Investigator’s Perspective

Kevin Bainey
Montreal, Canada
Montreal Live Symposium, Montreal Heart Institute – January 2016
DAPT 2016: The Complex / Multisystem Patient

Nairobi, Kenya
Aga Khan University – February 2016
Treatment of Mitral Regurgitation

Chicago, USA
American College of Cardiology (ACC)
65th Annual Scientific Sessions – April 2016
Multi-vessel PCI in STEMI with Multi-vessel Disease: A Meta-analysis and Trial Sequential Analysis

Sean van Diepen
Montreal, Canada
Canadian Cardiovascular Congress – October 2016
• The medical Management of Cardiogenic Shock: A Mini-Debate Series
• Critical Care Year in Review for the CICU Cardiologist Workshop
• CCS 2016 Guidelines: Optimal Care of the Post Arrest Patient
• Interventions for Advanced Heart Failure: Cardiogenic Shock Hemodynamic Phenotypes and Intravenous Vasoactive Therapies

New Orleans, USA
American Heart Association Scientific Sessions – November 2016
Reducing the Risk of Complications in Critically Ill Cardiac Patients: Lessons Learned from the Intensive Care Unit

Justin Ezekowitz
Durham, USA
EHR Think Tank, Duke University – February 2016
EHR: Practice Makes Perfect (Research)

Vancouver, Canada
Hot Topics in Cardiology – March 2016
CME: Changing Standard of Heart Failure Care

Sydney, Australia
Novartis Heart Failure Congress – June 2016
LCZ696 (sacubitril/valsartan) Experience
• Sodium and Heart Failure

Montreal, Canada
Canadian Cardiovascular Congress – October 2016
• Define Success in Heart Failure Management
• CCS 2016 – Guidelines: Ten Years of Heart Failure Guidelines - Managing A Complex Disease in Canada

Orlando, USA
Heart Failure Society of America (HFSA)
20th Annual Scientific Meeting – September 2016
How to Conduct Large Scale Dietary Intervention Trials in HF

Shaun Goodman
Toronto, Canada
Gauging the Guidelines, Canadian Collaborative Research Network – February 2016
“My patient had an MI one year ago with a stent: what do I do about their antiplatelet therapy?”
Cardiology for the Practitioner, St. Michael’s Hospital – April 2016

Vancouver, Canada
Hot Topics in Cardiology – March 2016
CME: Changing Standard of Heart Failure Care

Sydney, Australia
Novartis Heart Failure Congress – June 2016
LCZ696 (sacubitril/valsartan) Experience
• Sodium and Heart Failure

Montreal, Canada
Canadian Cardiovascular Congress – October 2016
• Define Success in Heart Failure Management
• CCS 2016 – Guidelines: Ten Years of Heart Failure Guidelines - Managing A Complex Disease in Canada

Orlando, USA
Heart Failure Society of America (HFSA)
20th Annual Scientific Meeting – September 2016
How to Conduct Large Scale Dietary Intervention Trials in HF

Finlay McAlister
Calgary, Alberta
O’Brien Institute of Public Health, University of Calgary – November 2016
I Do Health Services Research, What Can the ABSPORU Data Platform Do For Me?

Robert Welsh
Innsbruck, Austria
17th International Meeting - Integrated management of acute and chronic cardiovascular disease – January 2016
NSTEMI Systems of Care

Dubai, UAE
ESC Guidelines for NSTACS – February 2016

Waterton, Canada
Southern Alberta Cardiology Update – June 2016
Update on Acute Coronary Syndrome: The first thirty minutes
Trainees: The Next Generation of Health Researchers

The foundation of the Canadian VIGOUR Centre’s mission is to enhance cardiovascular health for current and future generations thereby fulfilling its contract with society. As a learning organization, one of the CVC’s central tenets is to engage the next generation of health professionals in a research culture that embraces curiosity, welcomes new ideas and seeks to address key unanswered questions that are likely to alter the minds and actions of all those involved in health care delivery. The CVC recognizes that a research experience can be life changing, whether during a summer studentship, an elective experience in clinical medicine, or through dedicated graduate or postdoctoral training. Whatever we provide to our trainees is inevitably returned to us bearing interest: this return on investment provides fresh and unbiased thinking, challenges to accepted dogma, and is formulated with an energetic and enthusiastic willingness to learn. Irrespective of an individual trainee’s career plans, exposure to research galvanizes the development of a more critical mind that can then be applied to the unending search for better health solutions. An attitude of lifelong learning, coupled with a continuing commitment to remain engaged in the process of research – irrespective of individual career destinations – is our aspiration for research trainees.

Featured Trainees

The following section features interviews with CVC trainees Abhinav Sharma, Jay Shavadia, and Dat Tran. In addition to sharing their insights and experiences as trainees, they also discuss their current and future research goals.

Abhinav Sharma
PhD Student, Medicine

What would you say are your research highlights and personal achievements from 2016?

My research highlights from 2016 are numerous. My focus is within diabetes and heart failure. I was able to publish an analysis on heart failure definitions in antidiabetic drug trials in the *Lancet Diabetes* and *Endocrinology Journal*. Furthermore, I was able to evaluate modes of death and international variations among patients with pre-diabetes in two papers published in the *American Heart Journal* and the *Journal of the American Heart Association*.

In terms of personal achievements, I have been fortunate to be a co-investigator on a successful American Heart Association Strategic Heart Failure Network Grant evaluating the impact of digital coaching on improving outcomes in patients with heart failure and diabetes. I also won an American Heart Association Young Investigator award to evaluate the comparative effectiveness analysis of anti-diabetic drugs in patients with diabetes and heart failure. Furthermore, I was fortunate to acquire a European Society of Cardiology Young Investigator grant to evaluate biomarker predictors of heart failure in patients with diabetes.

You are currently part of the Duke Clinical Research Institute (DCRI) Fellowship program. Can you describe the experience and knowledge you have gained from this opportunity?

It has been a phenomenal experience with excellent mentors and superb research opportunities. I have been able to leverage connections from the DCRI to start a number of collaborative projects with institutions around the world. For fellows interested in a research career, I would highly recommend coming down to the DCRI.

What are your career research goals?

To continue to develop my expertise in the field of diabetes and heart failure, extend my work from diabetes to explore the outcomes and interventions in the broader population of patients with heart failure and preserved ejection fraction, and develop increased insights into the research priorities of patients in the field of heart failure.
Jay Shavadia  
Fellow, Interventional Cardiology

What would you say are your research highlights and personal achievements from 2016?

Having the opportunity to work with faculty at the Duke Clinical Research Institute, and to gain insight into their breadth of experience in working with large cardiovascular registries and clinical trials has been fascinating. The Duke experience has further leveraged ongoing collaborations with faculty at the CVC and the University of Alberta, allowing me to expand my research portfolio.

You are currently part of the Duke Clinical Research Institute (DCRI) Fellowship program. Can you describe the experience and knowledge you have gained from this opportunity?

The DCRI fellowship is really a once in a lifetime experience with outstanding mentorship and opportunities to build truly global collaborations with faculty and fellows. Gaining experience in working with large acute coronary syndrome registries, such as the ACTION-GWTG and CathPCI, provides a unique exposure in addressing unanswered clinical questions that cardiologists encounter on a regular basis.

How has your association with the CVC influenced your experience at DCRI?

The cross-talk with CVC has certainly played an instrumental role in bolstering this experience with the continued interaction on mutual projects with the CVC faculty.

What are your career research goals?

With limited exposure to large clinical trials, I aim not only to build my scientific exposure, but really gain insights into the operational aspects of both traditional and pragmatic clinical trials. Additionally, I aspire to translate the knowledge gained into questioning our modus operandi of patient management.

Dat Tran  
PhD Student, Health Services and Policy Research

What would you say are your research highlights and personal achievements from 2016?

I have been working on a number of research projects during 2016. First, I have evaluated the temporal trends and provincial variations in hospital mortality and reperfusion strategy among patients with ST-segment elevation myocardial infarction (STEMI), which is an acute condition requiring expedited diagnosis and intervention and is costly to treat. This project provides important insights into reperfusion practice for STEMI patients in Canada, as it points out that fibrinolysis therapy could be as effective as the most preferable contemporary primary percutaneous coronary intervention, which is far more resource intensive (in both human expertise and equipment).

Secondly, I have benchmarked myocardial infarction (MI) care quality indicators in Canada, providing up-to-date insights into the long-term trends and provincial variations of MI care quality. In addition, I have been working on other projects in cardiovascular disease, such as evaluating hospitalization costs of congenital heart diseases in Canada, evaluating health services utilization and costs of syncope in Alberta, and benchmarking potential cost saving in provision of care for NSTEMI patients at coronary intensive care units in Canada.

I had several significant achievements in 2016. I published four peer-reviewed papers and was awarded the Charles WB Gravett Memorial Scholarship. I also had a number of abstracts presented at both national and international conferences in 2016.

What knowledge have you gained from your time at the CVC, and how has your experience as a trainee impacted your research?

I have benefited much from working at the CVC as a trainee. First, I have gained extensive knowledge in cardiovascular diseases, especially about acute myocardial infarction (AMI), through my thesis project and other research projects led by Drs. Kaul and Walsh. Second, I have learned to conduct a health outcomes research project independently and to critically evaluate research results. This is very important for my progress as an independent researcher in the future. As a result of my training at the CVC, I have been able to successfully frame up my thesis and I expect to graduate from my training program earlier than planned.

What are your career research goals?

I have set a target of graduating my PhD program by the end of 2017 and to join the workforce afterward. I have also targeted to publish 10 journal papers by the end of my PhD program. This goal is quite ambitious, but feasible thanks to the extensive support I have at the CVC.
Trainees: Where Are They Now

Since its inception, the CVC has been privileged to train a legion of health professionals. Several are now members of the CVC faculty who themselves have continued to build upon this legacy. This map illustrates the location of past and current CVC trainees, and the catalogue that follows documents each individual’s experience with the CVC and their subsequent career destination.
1. Jay Shavadia
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2001 – 2003
Current Position & Location: Assistant Clinical Professor and Staff Cardiologist, Royal Alexandra Hospital, Edmonton, AB

2. Debraj Das
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2010 – 2011
Current Position & Location: Cardiology Trainee, University of Alberta, Edmonton, AB

3. Mustafa Toma
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2004 – 2006
Current Position & Location: Clinical assistant professor University of British Columbia, Vancouver, BC

4. Teresa Tsang
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 1997 – 1999
Current Position & Location: Assistant Clinical Professor and Staff Cardiologist, Royal Alexandra Hospital, Edmonton, AB

5. Evan Lockwood
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2000 – 2002
Current Position & Location: Assistant Clinical Professor and Staff Cardiologist, Royal Alexandra Hospital, Edmonton, AB

6. Michael Tjandrajida
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2001 – 2002
Current Position & Location: Clinical Practitioner, Peel Memorial Hospital, Brampton, ON

7. Raymond Leung
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2001 – 2003
Current Position & Location: Assistant Clinical Professor and Interventional Cardiologist, Royal Alexandra Hospital, Edmonton, AB

8. Taha Taher
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2002
Current Position & Location: Assistant Clinical Professor and Staff Cardiologist, Grey Nuns Hospital, Edmonton, AB

9. Jacobus Stefanus De Villiers
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2012
Current Position & Location: Cardiology Residents Program Director and Director of the cardiology training program at the University of Saskatchewan, Saskatoon, SK

10. Michael McDonald
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2005 – 2006
Current Position & Location: Assistant Professor of Medicine, University of Toronto, and Director of the Advanced Heart Failure/Transplantation Program, University Health Network, Toronto, ON

11. Sammy Chan
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2001 – 2003
Current Position & Location: Assistant Professor, University of British Columbia and Cardiologist and Medical Director, Heart-Health Program, St-Paul’s Hospital, St-Paul, BC

12. Brian Wong
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2000 – 2002
Current Position & Location: Assistant Professor, University of Alberta, Edmonton, AB

13. Kebbie Josan
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2008 – 2009
Current Position & Location: Research Practitioner, University Health Network, Toronto, ON

14. Olga Toleva
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2013 – 2015
Current Position & Location: Assistant Professor and Interventional Cardiologist, University of Manitoba, Winnipeg, MB

15. Haiyu (Mike) Bao
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2011 - 2013
Current Position & Location: Assistant Professor, Mount Sinai St. Luke’s Hospitals, Icahn School of Medicine at Mount Sinai, New York, NY, USA

16. Aw Alherbish
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2012
Current Position & Location: Assistant Clinical Professor and Staff Cardiologist, Mount Sinai St. Lukes Hospitals, New York, NY, USA

17. Neda Dianati Maleki
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2014 – 2016
Current Position & Location: Research Assistant, University of Alberta, Edmonton, AB

18. Naji Kholaiif
Mentor(s): Paul W. Armstrong
Years as a Trainee at CVC: 2013 – 2015
Current Position & Location: Post Cardiology Specialized Training, University of Alberta, Edmonton, AB
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<th>Mentor(s):</th>
<th>Current Position &amp; Location:</th>
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<tr>
<td>Paul W. Armstrong</td>
<td>Assistant Clinical Professor and Rheumatologist, Royal Alexandra Hospital, Edmonton, AB</td>
<td>2000 – 2009 (Resident, Research Elective)</td>
<td>Assistant Professor of Cardiology, Internal Medicine and Cardiac Surgery, Tabib University, Medini, Saudi Arabia</td>
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**Moving Forward Together | The CVC 2016 Annual Report**
37. Nawal Almajed

**Mentor(s):** Justin Ezekowitz

*Years as a Trainee at CVC:* 2009 (Cardiology Resident, Research Elective)

**Current Position & Location:** Transplant Fellowship, University of Alberta, Edmonton, AB

**Publication Reference:** Ann Intern Med. 2011;154:401-412.

38. Seraj Abualnaja

**Mentor(s):** Justin Ezekowitz

*Years as a Trainee at CVC:* 2012 – 2015 (Cardiology Resident, Research Elective)

**Current Position & Location:** 2015 – 2016 Postdoctoral Fellow

**Publication Reference:** N/A

39. Eloisa Colin-Ramirez

**Mentor(s):** Justin Ezekowitz

*Years as a Trainee at CVC:* 2010 – 2014 (Cardiology Resident, Research Elective)

**Current Position & Location:** Assistant Clinical Professor, University of Alberta, Edmonton, AB

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2013 Apr;29(4):423-428.

**Publication Reference:** Can J Cardiol.

40. Michael Hanninen

**Mentor(s):** Justin Ezekowitz

*Years as a Trainee at CVC:* 2010 – 2011 (Cardiology Resident, Research Elective)

**Current Position & Location:** Assistant Clinical Professor, University of Alberta, Edmonton, AB

**Publication Reference:** J Am Heart Assoc. 2015;4:e002092.

41. Kristin Lyons

**Mentor(s):** Justin Ezekowitz

*Years as a Trainee at CVC:* 2010 – 2014 (Cardiology Resident, Research Elective)

**Current Position & Location:** Clinical Assistant Professor, University of Calgary, Calgary, AB


42. Robinder Sidhu

**Mentor(s):** Finlay McAlister

*Years as a Trainee at CVC:* 2015 (Interfaculty Graduate Student)

**Current Position & Location:** Attending Staff, General Internal Medicine, University of Alberta, Edmonton, AB

**Publication Reference:** JACC Heart Fail. 2014;2:368-376.

43. Jeysundar Radhakrishnan

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2010 – 2014 (Cardiology Resident, Research Elective)

**Current Position & Location:** Chief Medical Resident, Department of Medicine, University of British Columbia, Vancouver, BC

**Publication Reference:** N/A

44. Thomas Roston

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2010 (MSc Student, Translational Medicine)

**Current Position & Location:** Chief Medical Resident, Department of Medicine, University of British Columbia, Vancouver, BC

**Publication Reference:** N/A

45. Jacksy Zhao

**Mentor(s):** Padma Kaul, Justin Ezekowitz

*Years as a Trainee at CVC:* 2012 – 2015 (Cardiology Resident, Research Elective)

**Current Position & Location:** Clinical Nurse Specialist, Palliative Home Care, Alberta Health Services, Edmonton, AB

**Publication Reference:** N/A

46. Suman Dhesi

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2013 (MSc, Health Policy and Management)

**Current Position & Location:** Health Economist, Analysis Group, Montreal, QC

**Publication Reference:** N/A

47. Mohammed Almansori

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2016 (MSc, Health Policy and Management)

**Current Position & Location:** Intergovernmental Policy Advisor, Alberta Health, Edmonton, AB

**Publication Reference:** N/A

48. Qendresa Beki

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2017 (MSc, Health Policy and Management)

**Current Position & Location:** Intergovernmental Policy Advisor, Alberta Health, Edmonton, AB

**Publication Reference:** N/A

49. Amir Rastpour

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2013 (MSc, Health Policy and Management)

**Current Position & Location:** Health Economist, Analysis Group, Montreal, QC

**Publication Reference:** N/A

50. Sean Tiggelaar

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2010 – 2011 (Cardiology Resident, Research Elective)

**Current Position & Location:** Assistant Professor Internal Medicine, University of Alberta, Edmonton, AB

**Publication Reference:** N/A

51. Brendan Putko

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2010 – 2011 (Cardiology Resident, Research Elective)

**Current Position & Location:** Assistant Professor Internal Medicine, University of Alberta, Edmonton, AB

**Publication Reference:** N/A

52. Carmel Montgomery

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2010 (MSc Student, Nurturing)

**Current Position & Location:** Chief Medical Resident, Department of Medicine, University of British Columbia, Vancouver, BC

**Publication Reference:** N/A

53. Nina Lam

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2015 (MSc, Health Policy and Management)

**Current Position & Location:** Health Economist, Analysis Group, Montreal, QC

**Publication Reference:** N/A

54. Irfan Kherani

**Mentor(s):** Padma Kaul

*Years as a Trainee at CVC:* 2015 (MSc, Health Policy and Management)

**Current Position & Location:** Intergovernmental Policy Advisor, Alberta Health, Edmonton, AB

**Publication Reference:** N/A
Beyond 2000 XXII

On October 24, 2016, the CVC hosted the 22nd annual Beyond 2000 symposium in Montreal in conjunction with the Canadian Cardiovascular Congress. For the second year we held two symposia: New Concepts in Acute Coronary Syndrome (ACS) and New Concepts in Heart Failure and Atrial Fibrillation (HF/AFib), this year, however, they were blended into a consecutive three hour format. These programs were generously supported by unrestricted educational grants from AstraZeneca, Merck, Novartis, and Bayer, and as has been our tradition, we partnered with the Mazankowski Alberta Heart Institute and the University of Alberta in undertaking this venture.

The New Concepts in Acute Coronary Syndrome symposium was co-chaired by Dr. Jean-François Tanguay, Director of the Coronary Care Unit at the Montreal Heart Institute, and the program was keynoted by Dr. Christopher Granger, from Duke University, who provided an overview on hot-button issues in ACS management. Thereafter new opportunities in combating diabetes, the ongoing war against cholesterol, and lessons learned in ACS from Alberta registries and population data were featured. The New Concepts in Heart Failure and Atrial Fibrillation symposium began with an assessment by Dr. Jeff Healy from McMaster University on the timely and controversial topic of whether or not to treat silent atrial fibrillation. This was followed by an animated debate on the validity of prescribing drugs such as Sacubitril/Valsartan for all patients with HFrEF. Other topics included the trendy issue of dietary salt intake, the use and restriction of anticoagulants in patients undergoing surgery, and treatment progress for patients with HFpEF.

Both programs were exceedingly well received with strong, positive evaluations by the record-breaking number of registrants in attendance. A variety of post-event resource materials for both the ACS and HF/AFib symposium, which include interviews, recordings of the lectures, and presentation slides, can be found at www.Beyond2000.org.
On March 13, 2016, the CVC held the third annual Canadian VIGOUR Centre (CVC) Clinical Trials Colloquium in Banff, Alberta. We were pleased with the overwhelming response and interest from our investigative sites to be a part of this day. The agenda was structured as a full day session with combined participation from 16 Canadian sites (investigators and study coordinators) representing eight provinces. The program included presentations from our team at the CVC, from our Duke Clinical Research Institute (DCRI) colleagues, as well as representation from our nine sponsors.

Our summarized objectives were as follows:

1. Address site-specific issues germane to optimal research conduct; focusing on ethics, finance/budget to facilitate site participation and return on investment, and
2. Invent a preferred future for sustainable clinical research by transforming conventional randomized clinical trials (RCT) through:
   (a) Registry RCTs, other data information resources
   (b) Enhancing patient engagement
   (c) Employing novel info technology, e.g. mobile health

In advance, sites were asked to complete two surveys, the first related to the overall conduct of clinical trials at their site and the second related to budgets. The surveys were completed by all participating sites, which provided the basis for much of the discussion that ensued that day.

Facilitated by the CVC Assistant Director of Clinical Trials, Tracy Temple, together with the CVC Co-Directors Drs. Justin Ezekowitz and Shaun Goodman, the day included opening remarks from the CVC’s Founding Director, Dr. Paul Armstrong followed by Ty Rorick, Associate Director of Megatrials at the DCRI, sharing his experience and insights on feasibility and oversight. Dr. David Mazer from St. Michael’s Hospital in Toronto joined us wearing two hats, one as an experienced investigator and another as a hospital ethics chair. He was charged to provide us with a “Better Understanding of Ethics: Current and Future Issues for Research Ethics Boards (REBs) in Canada and recommended solutions.” Lisa Berdan, Director of Global Megatrials with the DCRI, inspired us as she talked about dissecting budgets and running cost efficient clinical trials.

The day was further enhanced with a presentation from Dr. Eric Peterson, Executive Director of the DCRI, who shared his insights about access to data. He challenged us to think about cost effective ways of doing clinical trials and collecting data. With technology continuing to evolve it was interesting to have Dr. Justin Ezekowitz take us through the evolution of this technology in clinical research and challenge us to think about innovative ways to incorporate it into future studies. Concluding our day, Dr. Shaun Goodman reminded us that despite the challenges of enrolling patients into clinical trials, those who are enrolled often do better likely because they are being closely monitored and treated. Engaging patients in clinical trials is a key element to any research study as is retaining their participation for the duration of the trial.

Thanks to our Canadian sponsors for the Colloquium (Alere, Amgen, AstraZeneca, Bayer, Boehringer Ingelheim, Merck, Novartis, Pfizer, and Sanofi), we were able to bring a representative sample of our Canadian sites together for this unique event. The Colloquium continues to give the CVC, our sites, and our sponsors an open forum for discussion while gaining a better understanding of how we can strive toward and implement more efficient clinical research in Canada.
In 2016, the faculty of the CVC had the privilege of hosting three outstanding, internationally renowned academics. The Distinguished Visitors Series is a continuing program generously sponsored by unrestricted educational grants from Novartis and Bayer.

These visits are a highlight of our CVC academic year and allow for one-on-one faculty time and teaching of our cardiology and research trainees. The speakers provide a welcome window on the global state of cardiovascular medicine as it relates to career choices for trainees and potential future directions for meaningful research. They constitute a seminal part of our educational and research mission.

Jeff Healey
MD, MSc, FRCP, FHRs
Director of Arrhythmia Services, Hamilton Health Sciences Senior Scientist, Population Health Research Institute, McMaster University

January 12-13, 2016
• The Canadian Stroke Prevention Intervention Network: What is Exciting in AF and Stroke Research in Canada?
• Sub-Clinical Atrial Fibrillation: How Canadian Research Will Define its Treatment!

During his visit in January 2016, Dr. Jeff Healey gave two well received talks – the first on “The Canadian Stroke Prevention Intervention Network: What is Exciting in AF and Stroke Research in Canada?” and the second on “Sub-Clinical Atrial Fibrillation”, and met with several University of Alberta faculty members about collaborative research endeavours. He also provided mentoring to several junior faculty members and post-graduate trainees interested in careers as clinical investigators.

L. Kristin Newby
MD, MHS
Professor of Medicine, Division of Cardiology Duke University Medical Center

June 1, 2016
• Cardiology Research Rounds: “Biomarkers in Cardiovascular Disease: How do we Move the Field Forward?”
• Cardiology Divisional Rounds: “Heart Disease, Big Data, and the Promise of Precision Medicine”

The Canadian VIGOUR Center and the University of Alberta Division Of Cardiology welcomed Dr. Kristin Newby as a distinguished visitor in June 2016. Her visit began with an insightful and forward thinking Grand Rounds on the role big data can play in developing the field of cardiovascular precision medicine. This was followed by an interactive and thought provoking Research Rounds on how to move the field of cardiovascular biomarker research forward. Faculty visits were productive and led to new research collaborations between the Canadian VIGOUR Center and the Duke Clinical Research Institute.

Bernard J. Gersh
M.B., Ch.B., D.Phil, F.R.C.P., F.A.C.C.
Professor of Medicine, Mayo Clinic College of Medicine Consultant, Cardiovascular Diseases and Internal Medicine Associate Chair, Academic Affairs and Faculty Development, Division of Cardiovascular Diseases Honorary Professor of Medicine, Department of Health Services, University of Cape Town, South Africa.

October 4-5, 2016
• Cardiology Research Rounds: “The rise and fall and possible rebirth of renal denervation for hypertension”
• Cardiology Divisional Rounds: “Stroke prevention in Atrial Fibrillation”

In October of 2016 we were delighted to host one of the legends of cardiovascular medicine, Dr. Bernard Gersh. Dr. Gersh delivered two presentations entitled “The Rise and Fall and Possible Rebirth of Renal Denervation for Hypertension” and “Stroke Prevention in Atrial Fibrillation”. His broad and deep knowledge coupled with his lucid and engaging style of communication were exceedingly well received by faculty and trainees. Bernie has been a friend and advisor to many at the University of Alberta; his wise counsel and world views expand the horizon of all whom he meets and epitomize what a distinguished professor provides during such academic visits.
The Canadian Cardiac Chronicle is a quarterly newsletter that includes information about the CVC’s current trials, upcoming projects that might be of interest to our site network, and recent publications from our faculty. The Chronicle is available on our website (www.thecvc.ca), and it is distributed to over 500 recipients, including investigative sites, sponsors, and international collaborators.
Thought Leadership
- Expert advice on cardiovascular disease, treatment guidelines, population health
- Promoting research characterized by quality, scholarship, and integrity
- Defining unmet clinical needs for patients with, and those at risk of developing, cardiovascular disease
- Aligning cardiovascular research with these unmet needs
- Enhancing return-on-investment in cardiovascular research
- Trial architecture, development, data acquisition, integration, analysis, and dissemination in peer-reviewed publications
- Creation of novel sub-studies aimed at mechanistically informing primary clinical trial results
- Mentoring junior faculty, medical trainees, students, and allied health professionals

Population Health and Economic Outcomes
- Analyzing healthcare administrative databases (CIHI and Alberta Health etc.)
- Linking health outcomes to urban/rural residence, socioeconomic group etc.
- Comparing cost-effectiveness of treatment options
- Collection of resource utilization and cost data
- Clinical Registry development

Biostatistical Analysis
- Consultation on design of research protocols/studies
- Statistical analysis plans, database specifications and data management
- Data analysis using SAS and R
- Generation of statistical tables, figures, listings, and interpretation of findings
- Execution of advanced statistical methods

Clinical Trials
- Project, site, and data management
- Negotiation and oversight of site contracts and payments
- Site/investigator selection and recruitment
- Investigative site start-up and training
- Communication/collaboration with all trial-related stakeholders
- Site regulatory compliance, data collection, and query resolution
- Clinical monitoring and adverse-event reporting
- Creation and dissemination of newsletters and trial-related communications

Clinical Data Registries
- CVC Clinical Data Registries contain data on patients that is critical for informing treatment guidelines, prognostic models, and describing temporal trends in therapies and outcomes.

Alberta HEART:
- J. Ezekowitz, P. Kaul, F. McAlister
- Seeks a better understanding of patients having, or at risk of developing, heart failure (HF)
- Data include history, lab, imaging, medications used, diagnoses, mortality, and demographics
- Informs on targeted therapies and diagnostic tests, with a focus on patients with diastolic HF

Vital Heart Response (VHR):
- R. Welsh, K. Bainey
- Seeks a better understanding of outcomes for patients with acute heart failure presenting at Edmonton emergency departments (EDs)
- Data include lab, imaging, medications used, ejection fraction, outpatient and inpatient diagnoses, mortality, and demographics
- Informs on outcome differences (e.g. self-presenting versus via EMS, admitted versus discharged home)
- Develops prognostic models based on presentation mode, admittance, treatment, etc.
- Predicts outcomes at time of (i) ambulance attendance, (ii) ED presentation and (iii) discharge home from or admittance to hospital

Acute Heart Failure – Emergency Management (AHF-EM):
- J. Ezekowitz, F. McAlister
- Seeks a better understanding of outcomes for patients with acute heart failure presenting at Edmonton emergency departments (EDs)
- Data include lab, imaging, medications used, ejection fraction, outpatient and inpatient diagnoses, mortality, and demographics
- Informs on outcome differences (e.g. self-presenting versus via EMS, admitted versus discharged home)
- Develops prognostic models based on presentation mode, admittance, treatment, etc.
- Predicts outcomes at time of (i) ambulance attendance, (ii) ED presentation and (iii) discharge home from or admittance to hospital

Moving Forward Together | The CVC 2016 Annual Report
Clinical Trials

With over 20 years of experience in Clinical Trial Operations for Phase II/III/IV and investigator initiated studies, our team brings the expertise and knowledge to deliver a high quality and well executed trial from study start-up to closeout. Having worked with over 460 Canadian Site Investigators which are representative of more than 230 institutions across Canada, we not only have the knowledge and expertise to understand their capabilities, but have also developed ongoing collaborations and relationships with them. This relationship enables us to approach the best sites who can deliver the right patients for the study. As an academic research organization, all of our clinical trials include the involvement of at least one of our faculty members who, as practicing physicians, are able to relate to the role of the investigator and site.

We have a very experienced, diverse, knowledgeable, and personable clinical trials team comprised of Clinical Trial Project Leads, Regulatory Specialists, a Monitoring Lead, regionally based monitors, and administrative support. Responsible for ensuring all operational aspects of the study run smoothly, our Clinical Trial Project Leads and Regulatory Specialists work closely with our sites to strive for rapid and efficient start-up, high recruitment and retention of patients that meet the study criteria, data entry that is accurate and well maintained, and delivery on time lines as laid out from study start-up to study completion. As the primary contact for the Canadian sites, the Clinical Trial Project Leads have their fingers on the pulse of all aspects of the trial, which enables them to maintain a good understanding of the overall functioning of the study while closely monitoring trends and issues across Canada.

In addition to conducting source document verification, drug accountability and other required monitoring related tasks, the CVC monitors use their visits as a teaching opportunity to share lessons learned and ideas from other sites. The advice and suggestions are beneficial to the daily work of site personnel and also help to ensure they are audit prepared.

The CVC is a strong advocate of continuing education for our staff, and in addition to being ICH/GCP trained, many of our team members also hold or are working toward the CCRP designation with SoCRA or the CCRA designation with ACRP. We maintain a strong focus on training and quality and encourage our teams to share their knowledge, lessons learned, and expertise on an ongoing basis in their work with sites and sponsors to help build more efficient and cost effective clinical trials in Canada.

Our clinical trials team works hard to establish and maintain strong relationships with our sites, sponsors, and partners to deliver efficient, cost effective, and high quality clinical trials. In addition to the relationships we have built, we also attribute our success in the management of clinical trials to the hands on, collaborative team approach we provide to our sites, sponsors, and partners.

Monitoring Team

Corrina Boyd, RN – Monitoring Lead
Susan Bonar, BScN, RN – Clinical Research Associate
Valerie Carr, BN, RN – Clinical Research Associate
Halina Nawrocki, RN – Clinical Research Associate
Francine Nole, RN – Clinical Research Associate
Linda Tardif, RN – Clinical Research Associate
Paula Tiller, BN, RN – Clinical Research Associate

Tracy Temple, RN, BScN
Assistant Director, Clinical Trials

Kalli Belseck, BA
Regulatory Specialist

Devon Blanchette
Regulatory Specialist

Kate Dawson, BSc
Regulatory Specialist

Lyndsey Garrity, BA
Clinical Trials Project Lead

Courtney Gubbels, BA
Clinical Trials Project Lead

Karim Kushmiruk, RN, PhD
Clinical Trials Project Lead

Jodi Parrotta, MA
Clinical Trials Project Lead

Paula Priest
Project Coordinator

Kris Reay
Administrative Assistant

Melisa Spaling, MEd
Clinical Trials Project Lead

Julianna Wozniak, MSc
Clinical Trial Project Lead

Nubia Zepeda, MSc
Clinical Trials Project Lead
Clinical Trials

**Trial: AEGIS-I**

**Study Title:** A Phase 2b Study of CSL112 in Subjects With Acute Myocardial Infarction  
**Protocol #:** CSLCT-HDL-12-77  
**Sponsor:** CSL Behring LLC  
**Drug:** CSL112  
**Clinical Trial Anticipated Time line:** August 2013 - December 2016  
**Study Purpose:** This is a multicenter randomized, double-blind, placebo-controlled, parallel-group, dose-ranging phase 2b study to investigate the hepatic and renal safety and tolerability of multiple dose administration of two dose levels of CSL112 compared with placebo in subjects with acute myocardial infarction (AMI).  
**Trial Status:** Database locked and sites closed. Results presented November 15, 2016 - American Heart Association meeting

**Patient Enrollment Target** (Canada/Global) 40/1212  
**Patient Enrollment Achieved to Date** (Canada/Global) 25/1258  
**Number of Sites Participating** (Canada/Global) 8/184

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**Trial: EXCEL**

**Study Title:** Exenatide Study of Cardiovascular Event Lowering: A Trial To Evaluate Cardiovascular Outcomes After Treatment With Exenatide Once Weekly In Patients With Type 2 Diabetes Mellitus  
**Protocol #:** BCB109  
**Sponsor:** AstraZeneca Amylin Pharmaceuticals, LLC  
**Drug:** Exenatide  
**Clinical Trial Anticipated Time line:** May 2009 - June 2017  
**Study Purpose:** This study will compare the impact of including exenatide once weekly in addition to usual care vs. usual care without exenatide on major cardiovascular outcomes as measured by the primary composite endpoint of cardiovascular-related death, nonfatal myocardial infarction (MI), or nonfatal stroke.  
**Trial Status:** Target enrollment reached, now in patient retention stage

**Patient Enrollment Target** (Canada/Global) 500/14000  
**Patient Enrollment Achieved to Date** (Canada/Global) 544/14753  
**Number of Sites Participating** (Canada/Global) 28/692

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**Trial: GALILEO**

**Study Title:** Global Study Comparing a rivaroxaban-based Antithrombotic Strategy to an antiplatelet-based Strategy After Transcatheter aortic valve (TAV) Replacement to Optimize Clinical Outcomes  
**Protocol #:** 17938  
**Sponsor:** Bayer  
**Drug:** Rivaroxaban Acetylsalicylic acid Clopidogrel  
**Clinical Trial Anticipated Time line:** September 2015 - August 2018  
**Study Purpose:** To assess whether a rivaroxaban-based anticoagulation strategy, following successful TAVR, compared to an antiplatelet-based strategy, is superior in reducing death or first thromboembolic events (DTE) To assess the primary bleeding events (PBE) of the rivaroxaban-based strategy compared to an antiplatelet-based strategy, following TAVR  
**Trial Status:** Actively enrolling Association meeting

**Patient Enrollment Target** (Canada/Global) 150/1520  
**Patient Enrollment Achieved to Date** (Canada/Global) 15/618  
**Number of Sites Participating** (Canada/Global) 10/140

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**Trial: HILO-HF Registry**

**Study Title:** High versus Low SpO2 oxygen therapy in patients with acute Heart Failure - Registry  
**Drug:** N/A  
**Clinical Trial Anticipated Time line:** November 2016 - June 2019  
**Study Purpose:** The primary objective is to determine whether inpatients presenting to the Emergency Department (ED) with symptoms suggestive of Acute Heart Failure (AHF), who receive supplemental oxygen adjusted at either a high (SpO2>97%) or low (SpO2~91%) oxygen saturation levels, leads to greater reduction in NT-proBNP at 72 hours.  
**Trial Status:** Actively enrolling

**Patient Enrollment Target** (Canada) 200  
**Patient Enrollment Achieved to Date** (Canada) 5  
**Number of Sites Participating** (Canada) 1

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**Trial: LEVO-CTS**

**Study Title:** A Double-Blind, Randomized, Placebo-Controlled Study of Levosimendan in Patients With Left Ventricular Systolic Dysfunction Undergoing Cardiac Surgery On Cardiopulmonary Bypass  
**Protocol #:** TNX-LVO-01  
**Sponsor:** Tenax Therapeutics Inc.  
**Drug:** Levosimendan  
**Clinical Trial Anticipated Time line:** March 2015 - April 2017  
**Study Purpose:** To evaluate the efficacy of levosimendan compared with placebo in reducing the co-primary endpoints of composite of all-cause death (Day 30), or use of mechanical assist (IABP, LVAD, or ECMO) (Day 5), or the composite endpoint of all-cause death (Day 30), perioperative MI (Day 5), or need for dialysis (Day 30), or use of mechanical assist (IABP, LVAD, or ECMO) (Day 5) in subjects with reduced LVEF undergoing cardiac surgery on CPB.  
**Trial Status:** Target enrollment reached, now in patient retention stage

**Patient Enrollment Target** (Canada/Global) 50/760  
**Patient Enrollment Achieved to Date** (Canada/Global) 165/884  
**Number of Sites Participating** (Canada/Global) 10/62
**Trial: OYDSEY Outcomes**

**Study Title:** Evaluation of Cardiovascular Outcomes After an Acute Coronary Syndrome During Treatment With Alirocumab  
**Protocol #:** EFC11570  
**Sponsor:** Sanofi-aventis Recherche & Développement  
**Drug:** Alirocumab (SAR236553/REGN727)  
**Clinical Trial Anticipated Time line:** June 2012 - March 2018  
**Study Purpose:** To compare the effect of alirocumab with placebo on the occurrence of cardiovascular events (composite endpoint of coronary heart disease (CHD) death, non-fatal myocardial infarction (MI), fatal and non-fatal ischemic stroke, unstable angina requiring hospitalization) in patients who have experienced an acute coronary syndrome (ACS) event 4 to 52 weeks prior to randomization and are treated with evidence-based medical and dietary management of dyslipidemia.  
**Trial Status:** Target enrollment reached, now in patient retention stage

- **Patient Enrollment Target** (Canada/Global) 340/18000  
- **Patient Enrollment Achieved to Date** (Canada/Global) 361/18313  
- **Number of Sites Participating** (Canada/Global) 38/1263

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**Trial: SODIUM-HF**

**Acronym Defined:** Study Of Dietary Intervention Under 100 MmOL in Heart Failure  
**Study Title:** Evaluation of Cardiovascular Outcomes After an Acute Coronary Syndrome During Treatment With Alirocumab  
**Protocol #:** MOP130275  
**Sponsor:** Investigator Initiated Study Funding - Canadian Institutes of Health Research (CIHR); University Hospital Foundation (UHF)  
**Clinical Trial Anticipated Time line:** December 2013 - 2019  
**Study Purpose:** To evaluate the long-term effects of a low-sodium containing diet on a composite clinical outcome composed of all-cause mortality, cardiovascular hospitalizations or cardiovascular emergency department visits in patients with heart failure.  
**Trial Status:** Actively enrolling

- **Patient Enrollment Target** (Combined Canada & Global) 1000  
- **Patient Enrollment Achieved to Date** (Canada/Global) 281/329  
- **Number of Sites Participating** (Canada/Global) 15/19

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**Trial: VICTORIA**

**Acronym Defined:** VeriCiguat Global Study in Subjects With Heart Failure With Reduced Ejection FrAction  
**Protocol #:** MK-1242-001  
**Sponsor:** Merck Bayer  
**Drug:** Vericiguat; Placebo  
**Clinical Trial Anticipated Time line:** May 2016 - December 2020  
**Study Purpose:** Randomized parallel-group, placebo-controlled, double-blind, event-driven, multi-centre pivotal phase III clinical outcome trial of efficacy and safety of the oral sGC stimulator vericiguat in subjects with heart failure with reduced ejection fraction (HFrEF)  
**Trial Status:** Actively enrolling

- **Patient Enrollment Target** (Canada/Global) 400/4872  
- **Patient Enrollment Achieved to Date** (Canada/Global) 9/220  
- **Number of Sites Participating** (Canada/Global) 7/190
CVC has an extensive site network across Canada of principal investigators (PIs) who actively participate in CVC managed clinical trials to meet patient enrollment targets. In addition to the sites located in Canada, the CVC also works with a number of international sites for the SODIUM-HF trial. This map represents the locations of 124 principal investigators who participated in nine (9) of the active clinical trials either coordinated by the CVC, or monitored by the CVC, in 2016. Nearly 50% of these sites have participated in more than one CVC managed clinical trial.

### Active Principal Investigators

<table>
<thead>
<tr>
<th>Active Principal Investigators</th>
<th>Total by Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>15</td>
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<tr>
<td>Alberta</td>
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</tr>
<tr>
<td>Mexico</td>
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</tr>
<tr>
<td>New Zealand</td>
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</tr>
</tbody>
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Moving Forward Together | The CVC 2016 Annual Report | 63
Another Evidence-based Addition to Peri-operative Cardiac Surgical Care: LEVO-CTS

By Sean van Diepen and Shaun Goodman

The levosimendan in patients with left ventricular systolic dysfunction undergoing cardiac surgery requiring cardiopulmonary bypass (LEVO-CTS) trial is an important contribution to the cardiac surgical peri-operative care literature. In patients undergoing cardiac surgery, patients with reduced left ventricular ejection fraction are at increased risk for low cardiac output syndrome. Low cardiac output syndrome describes a situation of impaired systemic perfusion from transient myocardial dysfunction associated with an up to 15-fold risk in short-term mortality.

Levosimendan is a calcium sensitizing inotropic agent with cardioprotective properties that has been reported to prevent and treat low cardiac output in small studies. Additionally, meta-analysis has suggested a potential mortality benefit in patients with reduced ejection fractions; however, high-quality evidence to support its routine use in cardiac surgical patients was lacking. While levosimendan is approved for use in heart failure in Europe, it is not available in North America.

In 2015, the Canadian VIGOUR Center partnered with the Duke Clinical Research Institute to expand LEVO-CTS into Canada; 10 sites enrolled a total of 165 patients contributing to an overall sample size of 882. The results were presented at the American College of Cardiology Scientific Sessions 2017 in Washington as a Late Breaking Clinical Trial and were published simultaneously online in the New England Journal of Medicine. The study reported no statistically significant differences in the co-primary composite outcomes of: (1) death, renal replacement therapy, peri-operative myocardial infarction, or the use of mechanical assist devices; or (2) death or mechanical assist device use. Levosimendan did, however, increase cardiac output, reduce the incidence of post-operative low cardiac output syndromes by 7.5%, and the use of inotropes beyond 24 hours by 8.8% without an increase in pre-specified safety endpoints or post-operative adverse events. Taken together, this is the first trial of an inotropic therapy in the cardiac surgical population to demonstrate hemodynamic efficacy and safety.

It can be disappointing when a trial does not meet its primary outcome, but there are some signals of efficacy among subgroups (low left ventricular ejection fraction, isolated coronary artery bypass surgery, and reduced glomerular filtration rate) that will certainly merit further investigation in secondary analyses or future trials. There was also a trend towards a reduction in all-cause mortality at 90 days, but the trial was not powered to show such a potential difference. Although a “negative” trial from a statistical standpoint for the primary outcomes, the study will likely be positively received by the clinical community because: (1) it is the first trial to provide high quality evidence that an inotrope is both hemodynamic effective and safe in high risk cardiac surgery patients; and (2) it may help define future low cardiac output syndrome prevention study populations.

We would like to gratefully acknowledge the hard work of our Canadian VIGOUR Center Clinical Trials Project Lead Jodi Parrotta, who skillfully quarterbacked our Canadian efforts. We would also like to thank all our outstanding site investigators and study coordinators with whom we have forged new – and hopefully lasting – collaborative investigative relationships. Most importantly, we would like to thank all the Canadian patients who volunteered to help advance our understanding of the potential efficacy and safety of levosimendan in cardiac surgery.
ECG Core Laboratory

The aim of our ECG Core Laboratory is to translate research results into clinically relevant applications. Using the ECG – a venerable but powerful biomarker – we can generate an improved understanding of the pathophysiologic processes involved in acute coronary syndromes (ACS), thereby enabling not only prediction of outcomes but also assessing effectiveness of treatment. These insights serve to further stimulate cardiovascular scientific research.

In 2016 we were pleased that Kevin Bainey accepted the role of Director of the ECG Core Laboratory given his extensive experience and work in this area. Dr. Bainey is deeply involved in the STEMI arena both as it relates to VHR projects but also has investigative interest in patients with ST Elevation MI. With his assistance, we were pleased to hire and train Eric Ly, a new core laboratory reader from Windsor with prior ECG experience.

The ECG Core Lab’s key project in 2016 was the Vital Heart Response (VHR) study. The VHR-2 project, led by Dr. Robert Welsh, is a regional initiative that aims to implement timely evidence-based reperfusion strategies to maximize the outcome of patients with ST-segment elevation myocardial infarction (STEMI). VHR-2 has enrolled 3,205 patients and the Core Lab has completed analysis of over 1,300 patients (in over 4,000 ECGs).

The use of VHR registry-acquired ECGs and the biostatistical analyses performed by Yinggan Zheng provide unique insights and often validation from “real world” patients as it relates to the original findings from our clinical trials.

Preparations began in late 2016 for the upcoming STREAM-2 (STrategic Reperfusion in Elderly Patients Early After Myocardial Infarction) study. STREAM-2 will build upon the important foundation laid by the first STREAM study in which the ECG Core Lab played a critical role. As in the first study, STREAM-2 ECGs will be analyzed for ST deviation (to determine area at risk) and resolution (as a marker of myocardial reperfusion) and QRS Score (for infarct size) in patients experiencing acute myocardial infarction (AMI). The Core Lab will also provide central adjudication for patients with rescue percutaneous coronary intervention (PCI) to determine whether the clinical indications for the procedure were met. The objectives of this study will be to compare the efficacy and safety of a pharmaco-invasive reperfusion strategy with primary PCI in elderly STEMI patients and also to compare the incidence of intracranial and non-ICH major systemic bleeding in these elderly STEMI patients who receive pre-hospital clopidogrel as an adjunct to half-dose TNK.

The ECG Core Lab also continued its mandate of conducting quality analyses using clinical research data in 2016. The Core Lab has accumulated a wealth of experience and continues to serve as valuable resource and training ground for the next generation of talented researchers. To date, ECGs from over 75,000 patients enrolled in studies around the world have been analyzed. This provides an excellent database for additional sub-studies, analyses, and research.
Clinical Trials

The PROACT-3 trial offered an opportunity for Yinggan (Gray) Zheng (along with CVC Faculty Drs. Ezekowitz, Armstrong, Welsh, and Goodman) to examine the concordance of site and adjudication committee-based diagnosis and their alignment with patient outcomes. In patients presenting with chest pain or shortness of breath, there was substantial agreement in the diagnosis made by emergency department physicians and the adjudication committee. However, in those cases without agreement, significantly worse short- and long-term mortality was observed. The value of an adjudication committee seems to be modest and disease-dependent, and should be carefully considered per trial type and disease state.

In the biomarker sub study of the APEX-AMI trial, Dr. Wendimagegn Alemayehu worked with Yinggan Zheng and CVC Faculty Drs. van Diepen and Armstrong to assess the temporal changes in inflammatory biomarkers captured at randomization and 24 hours post-randomization, and subsequently their associations with reperfusion after primary PCI and longer term outcomes. Successful coronary reperfusion was associated with less systemic inflammatory response. Greater temporal inflammatory changes were independently associated with worse 90-day outcomes.

Paul Brown, PhD student, has been exploring the use of composite endpoints in acute heart failure research in collaboration with CVC Faculty Dr. Ezekowitz. In recently published work, he investigated the performance of commonly used primary composite endpoint with respect to statistical power using data simulations, outlining their inherent limitations and practicalities with using these end points. 1

Population Health and Economic Outcomes

Health Economics and Quality of Life Assessment

In the modern era of cost conscious medicine, clinical management decisions must account for risks and benefits of new therapies and consider them in the context of short and long-term resource consumption. The CVC therefore uses empirical data from the population-health data repository to develop prediction models to estimate the current and future economic burden of cardiovascular disease on the Alberta and Canadian health care systems. In addition to the impact of interventions on mortality and morbidity, there is increasing interest in assessing their impact on patient reported outcomes such as health-related quality of life (HRQoL).

In 2016, CVC’s contribution to the field of health economics and quality of life research are exemplified by the following two publications. The first study examined the current and future cost burden of heart failure hospitalizations on the Canadian healthcare system. The study employed the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD) to identify heart failure hospitalizations between fiscal years 2004 and 2013. Multiple linear regression models were used to calculate the trend in prevalence and extrapolate these to 2030. Based on sophisticated statistical models, we estimated that by 2030, heart failure hospitalizations would cost $722 million (95% confidence interval $650-$801 million), with older adults (age ≥ 80 yr) accounting for 52% of costs. The research was led by Dat Tran, a PhD trainee in Health Policy and Management in the School of Public Health, under the supervision of Dr. Kaul.

The second study was an examination of HRQoL outcomes of one of the largest multinational cardiovascular trials of patients with acute coronary syndrome (ACS) treated without revascularization. The Targeted Platelet Inhibition to Clarify the Optimal Strategy to Medically Manage Acute Coronary Syndromes (TRILOGY ACS) trial randomized patients with ACS to either prasugrel or clopidogrel therapy plus aspirin. Outcomes showed a complex pattern suggestive of late benefits with respect to repeat clinical events and benefits confined to patients who underwent angiography. In examining HRQoL correlates of these patterns we found no baseline differences in HRQoL between patients randomized to either treatment. At 24 months, patients assigned to prasugrel vs. clopidogrel had higher unadjusted EQ-5D index scores. However, mixed effects models found no difference in EQ-5D scores among prasugrel and clopidogrel patients overall, or across subgroups stratified by angiography status. Among patients with non-fatal clinical events, patients on clopidogrel reported a larger decrement in HRQoL than patients on prasugrel.

Population Health Surveillance

The CVC is actively involved in examining population-level issues related to access, delivery, treatment, and outcomes of heart disease in Alberta and Canada. Healthcare administrative databases have become a cornerstone in the process of assessing performance and providing feedback to improve quality of health care delivery at a population-level. The integrated system of health care delivery in Alberta, with one centralized provider and one payer, has facilitated the linking of inpatient, outpatient (including ED), ambulance, pharmaceutical, and laboratory data at the patient level. The volume of data generated by linking the health care databases to environment, census, and other databases has brought us into the wider realm of “big-data”.

Recognizing the unique opportunity to harness the advantages emerging from the transformation of health care delivery in Alberta over the past decade, Drs. Kaul and McAlister organized, on behalf of the CVC, and the Alberta SPOR SUPPORT Unit (SPOR: Strategies for Patient Oriented Research; SUPPORT: Support for People and Patient-Oriented Research and Trials), a one-day conference to create the Alberta Big-data in Health Working Group. Over 30 researchers from both the University of Alberta and the University of Calgary, as well as key personnel from Alberta Health and Alberta Health Services with expertise in health services research, machine-learning, big-data analytics, geographic information systems, and environment research, met to discuss opportunities to inform cost effective medical decision-making and to illuminate the path for future research.

Population health research in 2016 has assisted CVC in realizing two of its central goals, namely research training and knowledge dissemination. The August 2016 issue of the Canadian Journal of Cardiology offers a prime example of our efforts to reach our target audience of cardiovascular care practitioners and policy-makers. Four of the papers in the issue (two with accompanying editorials) were from the CVC faculty. Their content speaks to several key areas including variation in both heart attack care and resource utilization across provincial boundaries, the importance of heart failure diagnostic testing in emergency rooms, and a study of readmission rates amongst patients with congenital heart disease.1,2,3,4 A fifth offering was a Canadian Cardiovascular Society statement on quality of care indicators for heart failure which Dr. Ezekowitz was involved in developing.5 It is particularly gratifying to note that the first authors of two of the original research articles are our trainees.

Business Operations and Administration

The business office is fundamental to the organizational and financial underpinnings of the CVC. Reviewing and negotiating contracts is one of its key tasks, alongside providing expert service in the areas of managing agreements, developing and tracking metrics, and executing invoices and site payments. Dedicated to financial stewardship, the business office prudently manages revenue and expense administration. It is also committed to the progress of information systems management, strategic planning, process improvement, and the promotion of learning and development initiatives.

The business office is responsible for the creation and distribution of all marketing materials aimed at creating strong brand awareness that speaks to the mission and values of this organization. Finally, the office facilitates communications between the CVC and many institutional partners, which include, but are not limited to, Duke Clinical Research Institute (DCRI), Alberta Health Services (AHS), and Northern Alberta Clinical Trials and Research Centre (NACTRC). Our dedication to upholding strong partnerships with these institutions is essential to the day-to-day operations of the CVC.

Carla Price, BSc
Interim Assistant Director, Operations

Oksana Grant, PCP
Finance and Operations Assistant

Ellen Pyear, MA
Business and Communications Coordinator

Lisa Souard
Executive Assistant to Dr. Paul Armstrong
CVC Faculty

The CVC Faculty are internationally recognized as Thought Leaders in their respective areas of interest, and they collectively represent a diverse field of clinical research.

Our faculty are passionately dedicated to advancing the frontiers of cardiovascular science through several domains:

- Clinical Trials – architecture, operational management, analysis and interpretation
- Registry Development – creative insights into the process of care of acute coronary syndromes and congestive heart failure
- Large Population Databases – informing the impact of research on practice and pointing towards unmet needs and future directions

Our faculty plays a pivotal role in linking new knowledge to the community, understanding the implications on health outcomes, embracing the quality feedback loop, and discovering science through clinical trials registries and population outcomes. The CVC faculty is deeply engaged in identifying, nurturing and mentoring the health professionals and leaders of tomorrow by grounding them in the discipline of cardiovascular research.

Dr. Armstrong’s research interests include:
- Development of novel methods to enhance clinical trial methodology
- Cardiovascular implications of diabetes and aging
- Pathophysiology and novel therapeutic approaches of congestive heart failure
- Diagnosis and management of acute coronary syndromes with emphasis on timely interventions

Dr. Ezekowitz’ research interests include:
- Testing the impact of drugs and processes of care for patients with acute heart failure
- Novel interventions for patients with chronic heart failure
- The impact of comorbidities such as atrial fibrillation, anemia and hip fractures in patients with heart failure
- Non-pharmacologic interventions such as diet and existing tools such as biomarkers or oxygen
- Population health outcomes and interventions
- Clinical trial design and endpoints

Dr. Goodman’s research interests include:
- Facilitating clinical trial, observational, and knowledge translation research in cardiovascular disease in Canada with a focus on:
  - Diagnosis, management, and prognosis of acute coronary syndromes
  - Optimal stroke prevention risk stratification and management in atrial fibrillation
  - Primary and secondary prevention of cardiovascular disease

Paul W. Armstrong, MD
- Distinguished University Professor, Division of Cardiology, University of Alberta
- Formerly Chair of the Department of Medicine, University of Alberta
- Founding Director, Canadian VIGOUR Centre
- Founding Director of TORCH (Tomorrow’s Research Cardiovascular Health Professionals), a Strategic Training Program Initiative
- Founding President of the Canadian Academy of Health Sciences
- 2014 Recipient of the University Cup, the University of Alberta capstone award for outstanding contributions in teaching, research and service
- 2014 Recipient of the Margolese National Heart Disorders Prize awarded annually to a Canadian who has made outstanding contributions to the treatment, amelioration, or cure of heart disease

Justin Ezekowitz, MBCh, MSc
- Co-Director, Canadian VIGOUR Centre
- Associate Professor, Division of Cardiology, University of Alberta
- Director, Heart Function Clinic, Mazankowski Alberta Heart Institute

Dr. Ezekowitz’ research interests include:
- Development of novel methods to enhance clinical trial methodology
- Cardiovascular implications of diabetes and aging
- Pathophysiology and novel therapeutic approaches of congestive heart failure
- Diagnosis and management of acute coronary syndromes with emphasis on timely interventions

Shaun Goodman, MD, MSc
- Co-Director, Canadian VIGOUR Centre
- Associate Head, Division of Cardiology, Department of Medicine, St. Michael’s Hospital
- Heart & Stroke Foundation of Ontario (Polo) Chair and Professor, Department of Medicine, University of Toronto
- Adjunct Professor, Department of Medicine, University of Alberta

Dr. Goodman’s research interests include:
- Facilitating clinical trial, observational, and knowledge translation research in cardiovascular disease in Canada with a focus on:
  - Diagnosis, management, and prognosis of acute coronary syndromes
  - Optimal stroke prevention risk stratification and management in atrial fibrillation
  - Primary and secondary prevention of cardiovascular disease

Moving Forward Together | The CVC 2016 Annual Report
Kevin Bainey, MD

- Assistant Professor and Interventional Cardiologist, Mazankowski Alberta Heart Institute, University of Alberta
- Director, ECG Core Lab, Canadian VIGOUR Centre
- Director, Interventional Cardiology Fellowship Program, Mazankowski Alberta Heart Institute, University of Alberta
- Co-Director of the ACS working group for Alberta Health Services Cardiovascular Health and Stroke Strategic Clinical Network

Dr. Bainey’s research interests include:
- Optimizing reperfusion strategies in ST-elevation myocardial infarction
- Population health outcomes in acute coronary syndromes

Sean van Diepen, MD

- Academic Cardiologist-Intensivist
- Assistant Professor of Critical Care Medicine, Department of Critical Care and Division of Cardiology, University of Alberta
- Associate Editor, American Heart Journal

Dr. van Diepen’s research interests include:
- Critical care cardiology
- Cardiovascular surgical care
- Critical care resource utilization

Padma Kaul, PhD

- Director, Outcomes Research, Canadian VIGOUR Centre
- Associate Professor, Department of Medicine, University of Alberta
- Adjunct Assistant Research Professor, Duke University Medical Center
- Adjunct Associate Professor, School of Public Health, University of Alberta

Dr. Kaul’s research interests include:
- International differences in practice patterns and outcomes
- Sex differences in treatment and outcomes of cardiovascular disease
- Long term chronic disease implications for pregnancy related complications
- Issues related to access, delivery, and costs of care at a population level

Findlay McAlister, MD, MSc

- Professor of Medicine, University of Alberta
- Director, Patient Health Outcomes Research and Clinical Effectiveness Institute, University of Alberta
- Lead, Data Platform for the Alberta SPOR Support Unit
- Senior Health Scholar, Alberta Innovates - Health Solutions (2010 - 2017)
- Capital Health Chair in Cardiovascular Health Outcomes
- Past-Chair, Outcomes Research Task Force, Canadian Hypertension Education Program
- Past-President, Canadian Society of Internal Medicine

Dr. McAlister’s research interests include:
- Outcomes research in hypertension, heart failure, perioperative care, and coronary artery disease
- Clinical epidemiology methodology with a focus on evidence-based medicine and implementation of evidence at the bedside
- Methodology of trials and systematic reviews

Robert Welsh, MD

- Professor, Division of Cardiology, University of Alberta
- Edmonton Zone Medical Director, Cardiac Sciences
- Interventional Cardiologist, Mazankowski Alberta Heart Institute
- Director, Adult Cardiac Catheterization and Interventional Cardiology program
- Co-chair of Vital Heart Response
- Co-chair of the Mazankowski TAVI Program

Dr. Welsh’s research interests include:
- Acute Coronary Syndromes and Interventional Cardiology
- Cardiovascular disease and diabetes
- Exercise physiology and cardiac physiology
- Pre-hospital management of STEMI and the interaction of pharmacological (antithrombotic and fibrinolytic) and mechanical interventions (primary and rescue angioplasty)
Collaborators

The CVC has forged strong partnerships with a number of institutions and centres around the world in the pursuit of novel research directions and the advancement of cardiovascular research. The CVC takes great pride in our relationship with these collaborators, who are internationally recognized leaders in the advancement of cardiovascular research.

The map to the right illustrates the CVC’s worldwide network of collaborators:

1. BRAZILIAN CLINICAL RESEARCH INSTITUTE
   Sao Paulo, Brazil
2. C5 RESEARCH, CLEVELAND CLINIC
   Cleveland, USA
3. CHARITÉ – UNIVERSITÄTSMEDECIN BERLIN
   Berlin, Germany
4. DUKE CLINICAL RESEARCH INSTITUTE, DUKE UNIVERSITY
   Durham, USA
5. ICANN SCHOOL OF MEDICINE, MOUNT SINAI
   New York, USA
6. INOVA HEART AND VASCULAR INSTITUTE, INOVA FAIRFAX HOSPITAL
   Falls Church, USA
7. LEUVEN COORDINATING CENTRE, UNIVERSITY OF LEUVEN
   Leuven, Belgium
8. PERFUSE STUDY GROUP, HARVARD MEDICAL SCHOOL
   Boston, USA
9. SAMU URGENCES DE FRANCE
   Pontoise, France
10. STANFORD CENTER FOR CLINICAL RESEARCH, STANFORD UNIVERSITY
    Stanford, USA
11. THE HEART AND STROKE RICHARD LEWAR CENTRE OF EXCELLENCE,
    UNIVERSITY OF TORONTO
    Toronto, Ontario
12. UPPSALA CLINICAL RESEARCH CENTRE, UPPSALA UNIVERSITY
    Uppsala, Sweden
The CVC gratefully acknowledges and thanks:

• the patients, for their willing participation in trials, they are the heroes of clinical research;

• the CVC faculty, external advisors and collaborators for their contributions and for providing ongoing research opportunities, we look forward to providing continued services and to future collaborations;

• the CVC staff and management for their dedication, professionalism, excellent contributions and ingenuity that enhances the quality of our research work;

• our trainees for their commitment and enthusiasm as the next generation of researchers;

• the sponsors and granting agencies, without their financial support these trials and educational activities would not be possible;

• the excellent work of Ellen Pyear, Lisa Soulard, Richard Rothery, Carla Price, and Oksana Grant for their time and the dedication required to produce this report;

• AM/FM for the concept and design;

• photographers Mathew Martin and Stephen Wreakes for many of the images enclosed in this report.