# Cardiac Sciences

## Annual Report

2021–2022

UNIVERSITY OF CALGARY
CUMMING SCHOOL OF MEDICINE
Department of Cardiac Sciences

Alberta Health Services

LIBIN CARDIOVASCULAR INSTITUTE

UNIVERSITY OF CALGARY

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# Executive Summary

The year 2021-2022 was marked by continued challenges for the Department of Cardiac Sciences. The Department maintained both quality and access to essential cardiovascular care despite continual uncertainty due to rapidly evolving public health COVID-19 directives. We faced numerous outbreaks across all sites which proved a challenge to maintaining care. The Department was agile when needed and rapidly adapted to change. The Department was successful in promptly and effectively restructuring cardiovascular services throughout the Zone to ensure a seamless provision of quality cardiac care throughout the pandemic.

The Department critical care team and cardiac anesthesia service deserve credit for outstanding service during the COVID-19 pandemic. In addition to the group's typical responsibilities, they provided increased coverage during the peak of the pandemic and the multiple surges. In addition, the multidisciplinary ECMO team and the SHOCK Team provided care pathways for the sickest and most resource-intensive patients. Our diverse clinical teams should be commended for their rapid adaption to new service delivery models and cost-saving innovative solutions—such as same-day discharge, post-device implantation, and standardized heart failure pathways—across the city, which reduced hospital admissions. The lessons learned during the pandemic will help shape future care models toward improved efficiency, value, access, and appropriateness.

The Physician Wellness Committee and Equity Diversity and Inclusion Committee continue to provide support, insight, and education into systemic barriers to equity, wellness, and staff retention. The Wellness program continues its partnership with Well Doc Alberta with the aim of informing future efforts to reduce the growing and concerning rates of burnout—a concern that is at the forefront for the Department.

Recruits in interventional cardiology, data science, preventative cardiology, women's cardiovascular health, advanced heart failure, cardiovascular health economics, and public health were another high priority. However, there were numerous challenges in this process and a number of positions remain vacant.

Multidisciplinary team approaches are a priority and strength of the Department. The Calgary Aortic Program's goal is to achieve excellence in managing thoracic aortic disease. The Program continues to mature and will facilitate a more unified and standardized multi-disciplinary team approach to the management of complex aortic disease. The Minimally Invasive Cardiac Surgery Program continues to expand and offer leading-edge surgical techniques and education initiatives. Both programs continue to be national leaders with Canadian firsts in their respective fields using innovative techniques and devices. The coronary percutaneous and structural heart interventional teams continue to expand. The program provides outstanding results for patients and great patient satisfaction with rapid recovery and early discharge from hospital. Our world-class electrophysiology clinical team has been challenged by limited access to perform procedures due to the pandemic but continue to achieve academic excellence.

Clinical research remains a key strength of the Department. It was highly successful in terms of both research impact and productivity. The Department's research productivity exceeded average for the Cumming School of Medicine (CSM). Likewise, the Department's research impact, measured through annual citations per fulltime equivalent, significantly outpaced the CSM average. Membership within the Libin Cardiovascular Institute published more than 700 papers in the last year and received nearly $30 million in total research revenue.

Education is a cornerstone of the Department. Specialty clinical fellowship programs in electrophysiology, heart failure, interventional cardiology, and echocardiology, as well as strong core clinical education programs in cardiology and cardiac surgery, were essential to the overall success of the Department. Loss of established funding models due to financial restraint will make it challenging to retain these critical programs over the next year and beyond. Core cardiology and core cardiac surgery trainees successfully passed their Royal College exams and are making the transition to competency by design. The Department recruited a Deputy Head of Education to help integrate and provide oversight over all educational programs.

# Departmental Structure & Organization

The Department of Cardiac Sciences is the arm of the Libin Cardiovascular Institute responsible for the delivery of clinical care. The Institute is a joint entity of Alberta Health Services and the University of Calgary, which also has a mandate that includes research and education.

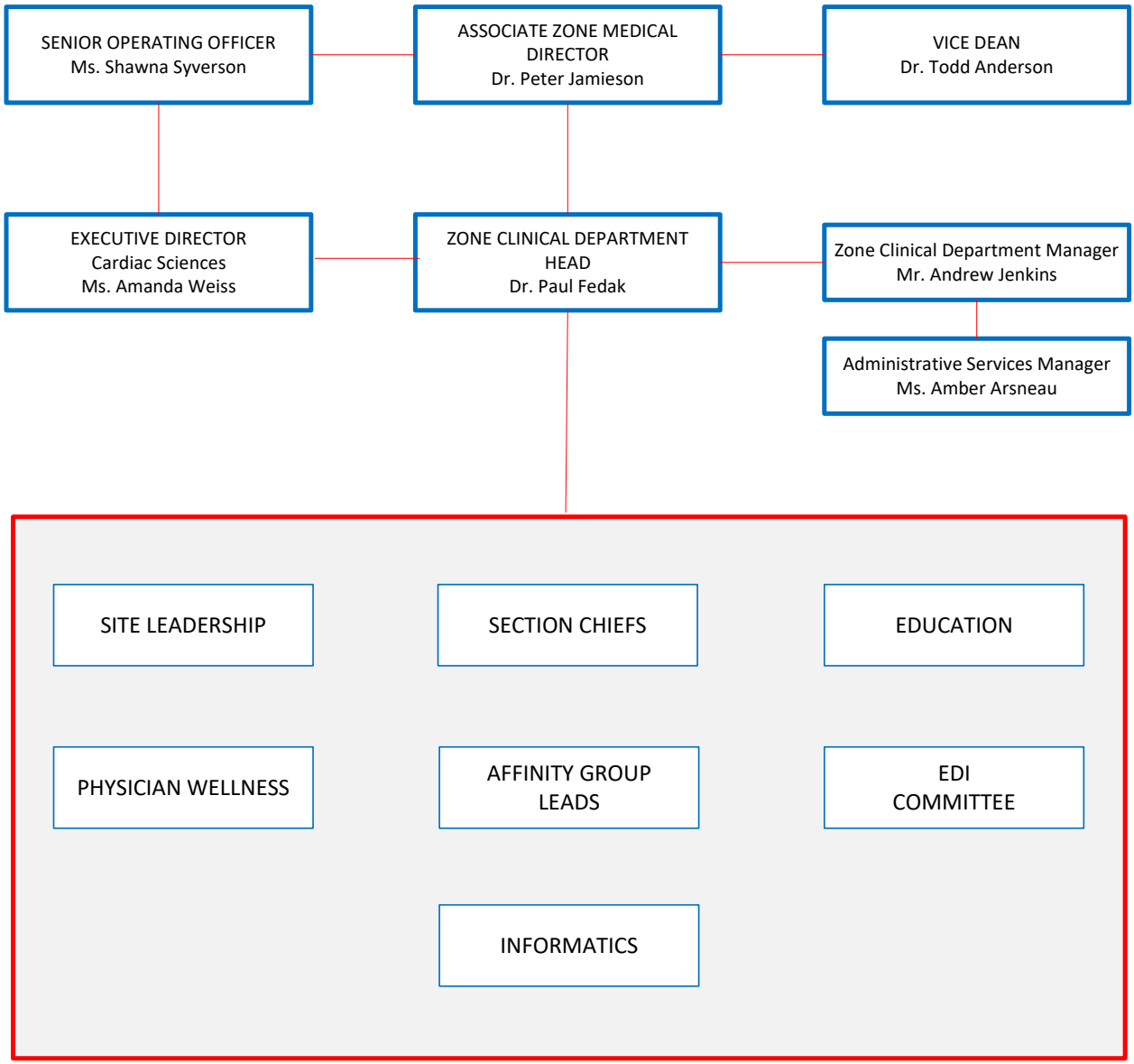

**Alberta Health Services** is the most extensive integrated provincial health care system in Canada. Care is divided by geographic location, and the Calgary Zone is the largest in Alberta. The Calgary Zone serves over 1.6 million people within a 40,000-kilometer squared area. This geographic area is over five times the size of Prince Edward Island. The Department of Cardiac Sciences coordinates cardiovascular care delivery for the Calgary Zone, which is largely administered through four acute care hospitals within the city of Calgary. Life-saving cardiovascular procedures (open-heart surgery, percutaneous coronary interventions, and others) are delivered to more than two million Albertans across three adjacent zones in Southern Alberta.


The membership of the **Department of Cardiac Sciences** is primarily composed of cardiologists and cardiac surgeons. Our 67 cardiologists have a mix of clinical, research, education, and leadership/administrative responsibilities. The growing team of 11 clinical cardiac surgeons, which also hold a mix of academic responsibilities and clinical interests, are a source of pride for the Department. While cardiology and cardiac surgery represent the Department's primary sections, the Department is a fully integrated team providing a cardiovascular service line. As such, the Department has affiliated membership with Cardiac Anaesthesia and Cardiac Intensive Care colleagues. The cardiovascular service line delivery model's integrated nature represents a fundamental value proposition of the Department's organizational leadership. Our members deliver clinical services to the health region as ambulatory care, cardiac diagnostics, and life-saving interventional procedures such as open-heart surgery, structural heart interventions (TAVI), and primary coronary interventions (PCI) for acute myocardial infarctions and coronary revascularization. The Department of Cardiac Sciences provides the majority of cardiovascular care throughout the vast health region. Two community private practice outpatient ambulatory cardiac clinics also play an essential role in delivering outpatient ambulatory and diagnostic care in partnership with Department members. Many of these community physicians are affiliated members of the Department.

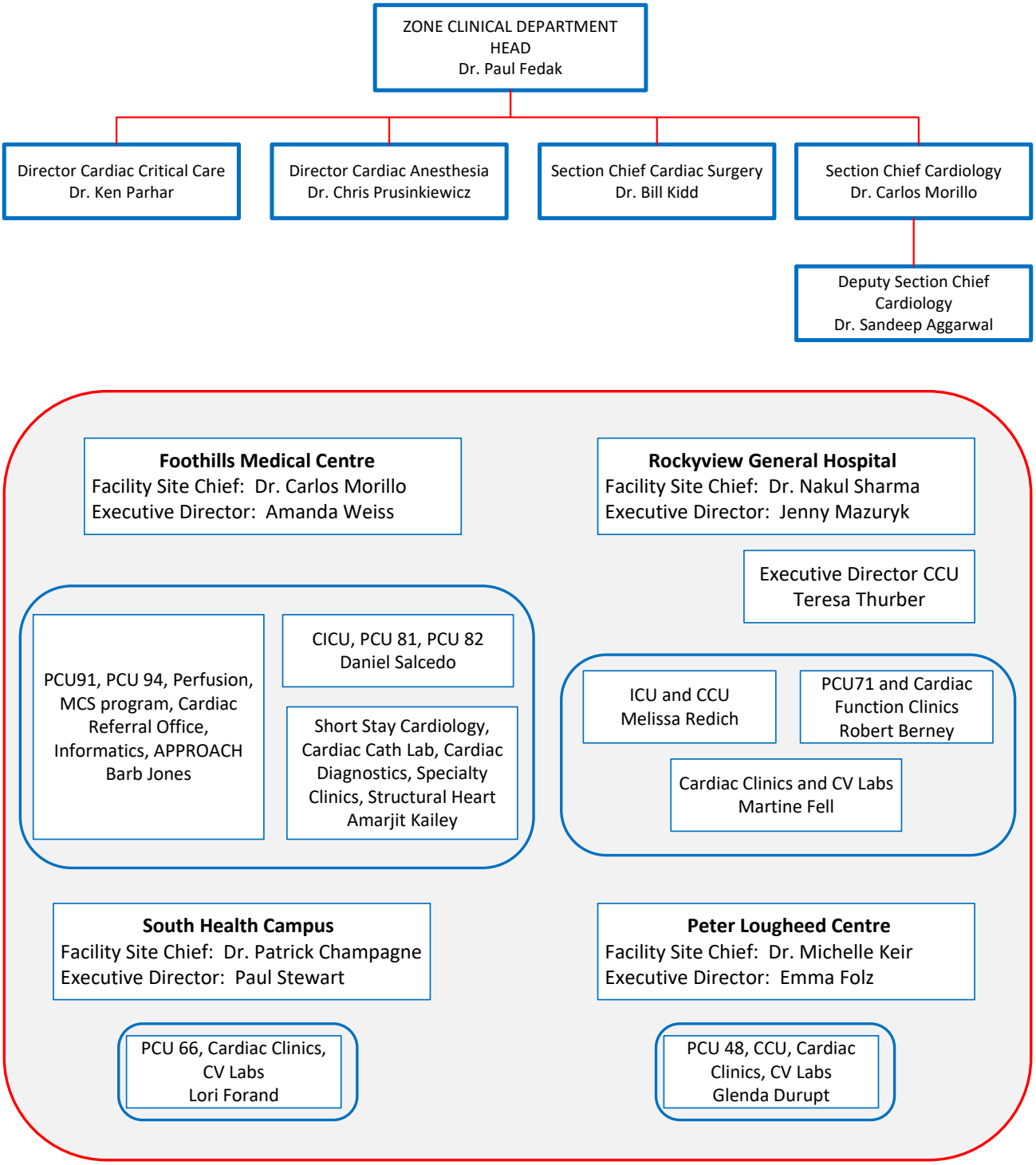

The **Libin Cardiovascular Institute (LCI)** is a joint entity of the University of Calgary and Alberta Health Services. The Institute coordinates all cardiovascular health care, education and research throughout the University of Calgary and the Calgary Zone of Alberta Health Services. The LCI is a wide-ranging program of cardiovascular integration that includes four large University of Calgary faculties, 10 faculty of medicine Departments, four Alberta Health Services clinical Departments and five Alberta Health Services hospitals that work as a synergistic team to help all Albertans. This large-scale, highly integrated enterprise represents an exciting opportunity to address the changing needs of cardiovascular care within our communities. The Institute believes lessons learned could be useful for health-care systems around the world.

# Governance

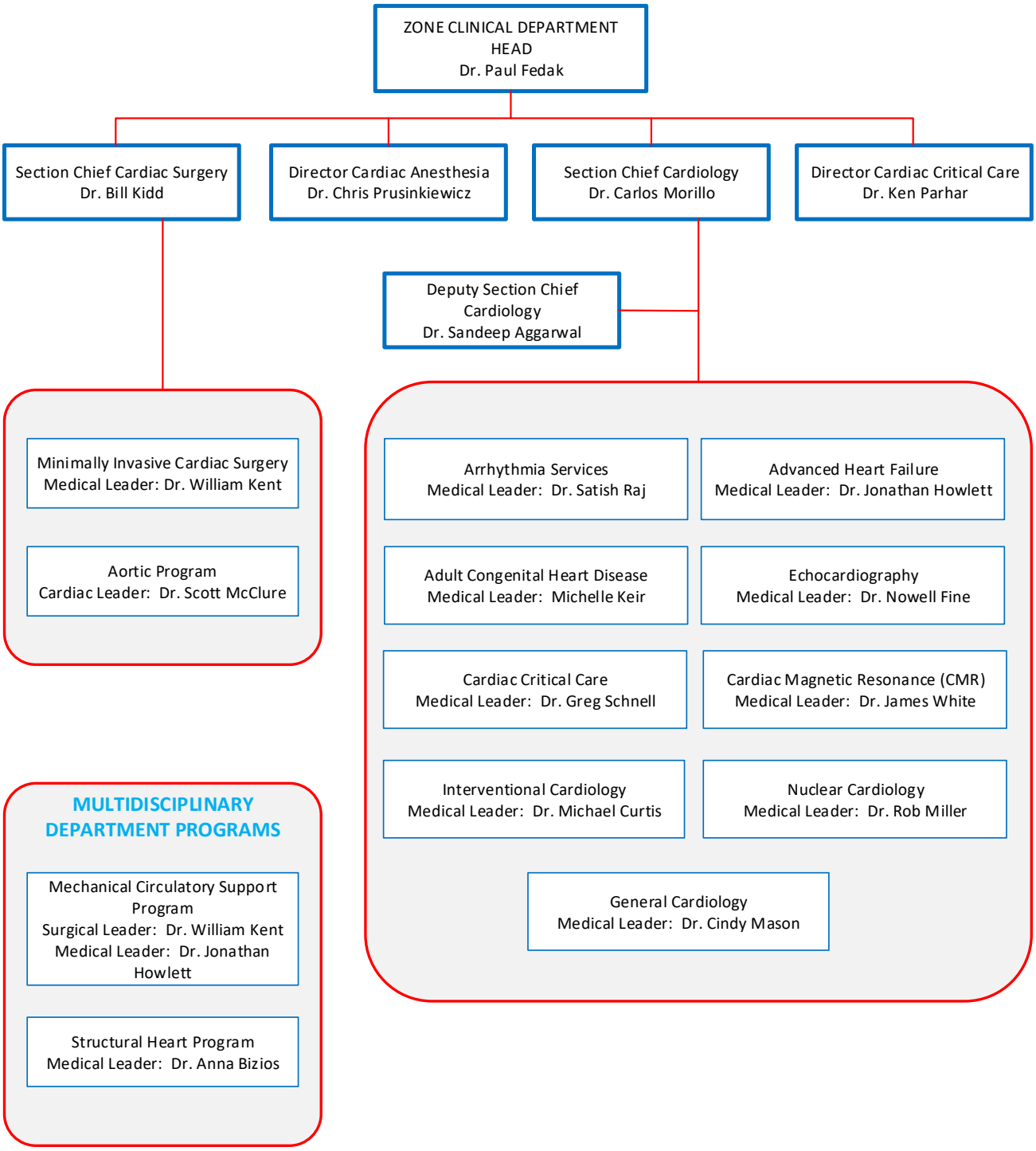
CORE LEADERSHIP
DEPARTMENT OF CARDIAC SCIENCES



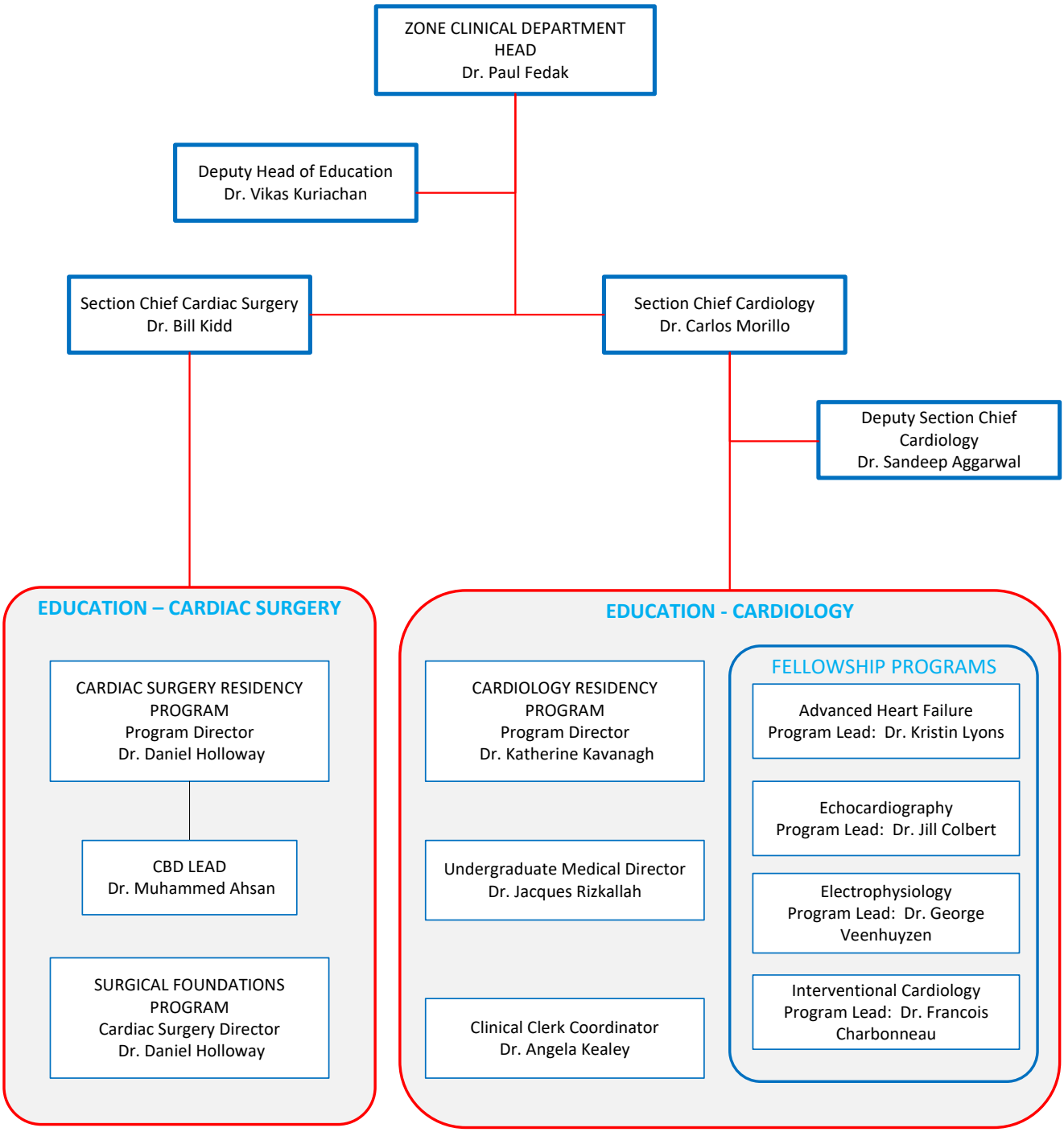
## SITE LEADERSHIP
## DEPARTMENT OF CARDIAC SCIENCES



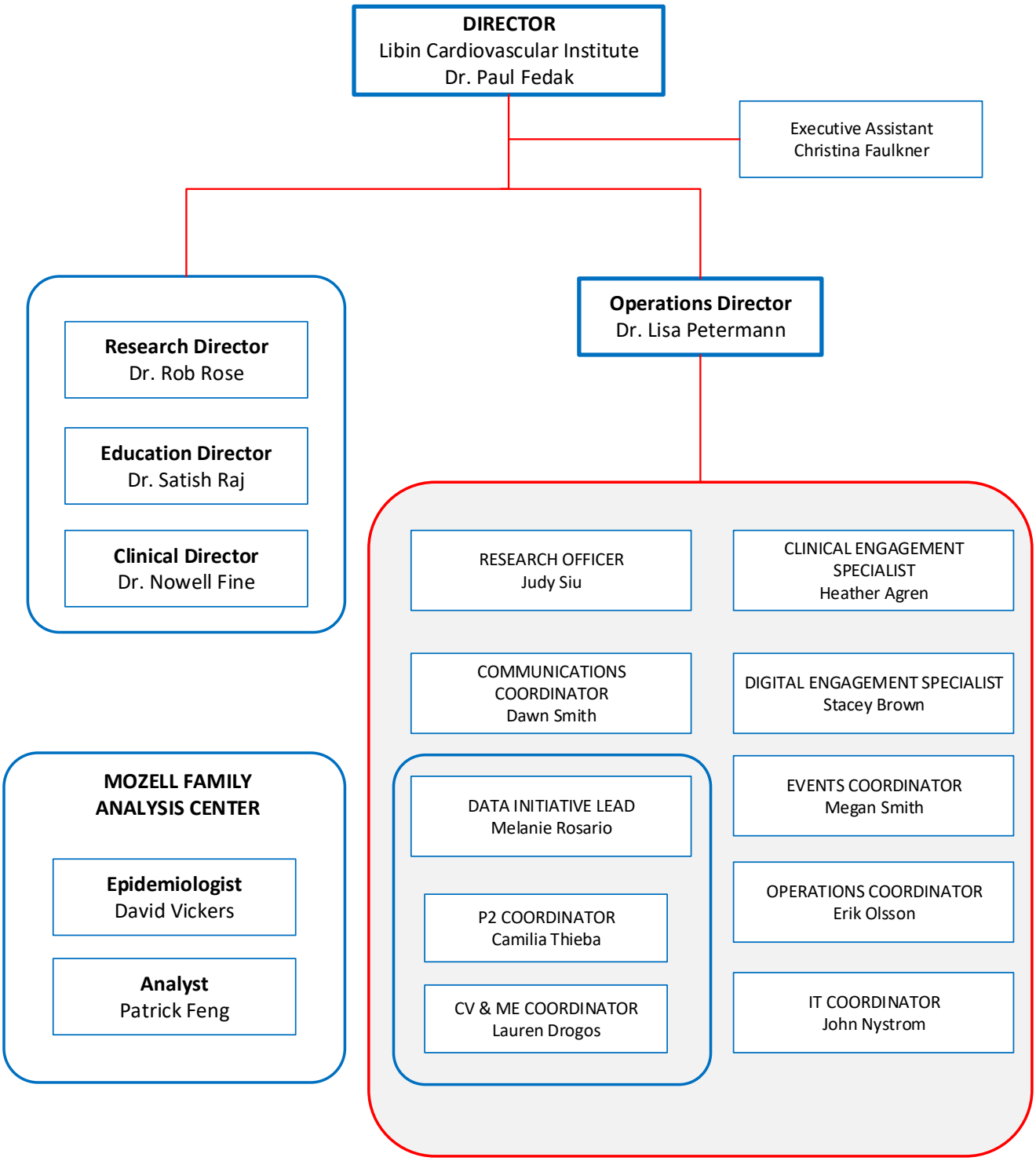
## PROGRAM LEADERSHIP
## DEPARTMENT OF CARDIAC SCIENCES



## EDUCATION
## DEPARTMENT OF CARDIAC SCIENCES



## LIBIN CARDIOVASCULAR INSTITUTE



# Sections

The Department of Cardiac Sciences has four components: Cardiology, Cardiac Surgery, Cardiac Anesthesiology, and Cardiac Critical Care.

## *CARDIOLOGY*

The Section of Cardiology provide a unique program of standardized citywide care and continues to develop innovative care pathways. The Section provides both primary care and specialized care in numerous clinics around the city with specialties that include arrhythmia, atrial fibrillation, adult congenital heart disease, aortopathies, cardio-oncology, cardiac implantable electronic devices, hypertrophic cardiomyopathy, cardiac rehabilitation, heart failure and transplant, syncope and autonomic dysfunction, and cardiology rapid access clinics. Section members also provide primary cardiology care and diagnostic tests that include exercise testing, echocardiography, myocardial perfusion imaging, CT scan and Cardiac MRI. Highly specialized care is provided at the Foothills Medical Centre with cardiology in patient services with CCU capacity at all city-wide sites (SHC, PLC, RGH).

***Dr. Carlos Morillo***
***Section Chief, Cardiology***

## *CARDIAC SURGERY*

The Section of Cardiac Surgery currently is comprised of 11 active members. One member has a GFT appointment at the University of Calgary and the remainder have clinical appointments with the University. Dr. Andrew Maitland retired in the fall of 2021. The Section owes a great debt to Dr. Maitland, whose accomplishments include the establishment of a minimally invasive valve surgery program, many research endeavours, and overall academic and clinical leadership. The Section also changed Chiefs in the fall of 2021. Dr. William Kidd replaced Dr. Imtiaz Ali as the outgoing Chief. Dr. Ali's 10-year term was remarkable. He led the way in many clinical, research and teaching endeavours. His style of collaboration, teambuilding, and openness to new ideas and innovation, including multiple new recruits, has put the section in a very strong position. We also offer congratulations to Dr. William Kent for successful promotion to the academic rank of Clinical Associate Professor of Medicine, Cumming School of Medicine

***Dr. William Kidd***
***Section Chief, Cardiac Surgery***

## *CARDIAC ANESTHESIOLOGY*

The Cardiac Anesthesia Group (CAG) consists of 10 sub-specialty trained anesthesiologists who hold primary appointments in the Department of Anesthesiology, Perioperative and Pain Medicine (Foothills Medical Centre Section), with joint membership in the Libin Cardiovascular Institute. Members also hold clinical appointments within the University of Calgary. All group members have successfully completed the National Board of Echocardiography Perioperative Examination and received certification in perioperative transesophageal echocardiography from the College of Physicians and Surgeons of Alberta.

The Director of Cardiac Anesthesia is Dr. Chris Prusinkiewicz, who represents the CAG on both the Zone Anesthesia Executive Committee and the Cardiac Sciences Executive Committee. Multiple group members hold leadership positions including Dr. Alex Gregory (Director of Cardiac Anesthesia Research and Director of the Cardiac Anesthesia Fellowship Program), Dr. Doug Seal (Cardiac Anesthesia Lead for Perioperative Blood Conservation), and Dr. Nicole Webb (Cardiac Anesthesia Rotation Resident Coordinator).

Dr. Michael Gysel joined the CAG in 2021, following the successful completion of a cardiac anesthesiology fellowship at Duke University. He will be taking a leading role in the development of quality assurance and quality improvement programs in cardiac anesthesia.

***Dr. Chris Prusinkiewicz***
***Director, Cardiac Anesthesia***

### *CARDIAC CRITICAL CARE*

The Cardiovascular Intensive Care (CVICU) provides high quality care for post cardiac surgery patients. This is only possible through the amazing dedication, teamwork, and collaboration of the departments and multidisciplinary teams involved in the journey of the cardiac surgery patients. The unit has 22 beds on two separate units (U94 and U104). Sixteen of these beds are funded.

The CVICU at the Foothills Medical Centre supported more than 1,400 cardiac surgery patients in 2021. The CVICU specializes in post-operative open-heart surgery with most cases being Coronary Artery Bypass Graft (CABG) and valve repair or replacement. The CVICU also cares for patients with the following advanced surgeries: complex thoracic aortic surgery, minimally invasive valve surgery, including alternate approaches to femoral-based Transcatheter Aortic Valve Implantation (TAVI), Extracorporeal Life Support (ECLS) for both temporary heart and lung support (VV/VA ECMO), and Ventricular Assist Devices (VAD), which provide short term and more durable heart support.

***Dr. Ken Parhar***
***Director, Cardiovascular Intensive Care Unit***

## Departmental Committees

### *PHYSICIAN WELLNESS*

**Lead – Dr. Vikas Kuriachan**

The Cardiac Sciences Physician Wellness Committee consists of representatives across all four sections of the Department. Representatives include Drs. V. Kuriachan (chair), J. Colbert, A. Kealey, K. Parhar, W. Kidd, and C. Prusinkiewicz. The committee addresses organization wellness concerns that arise and works with Well Doc Alberta. Staff physicians in the Department of Cardiac Sciences are welcome to approach committee members to discuss any wellness and burnout issues that arise.

The committee ensures all staff physicians have access to necessary resources such as the Alberta Medical Association Physician and Family Support Program (PFSP) and the Office of Professionalism, Equity and Diversity. The committee is also available to liaise and support trainee wellness and works closely with clinical training programs within the Department.

Some of the committee's activities included:

- Wellness/burnout survey of physicians with Well Doc and workshop. Survey with Well Doc / PGME planned for clinical trainees in Cardiac Sciences in the fall of 2022
- Organizing academic-half day wellness events for trainees
- Activities during COVID with help from the Department and the Libin Cardiovascular Institute:
- Phone and email "checks" during COVID with colleagues who are on quarantine
- Wellness boxes (snacks and amenity items) delivered to all cardiology trainees and staff in quarantine in collaboration with the Libin Institute)
- Regular dissemination of wellness/burnout tips and resources

## Accomplishments & Highlights

### *CARDIOLOGY*

**Section Chief – Dr. Carlos Morillo**

The Section of Cardiology (DOC) continues to expand its clinical footprint. The DOC's seven affinity groups provide support on all the clinical and diagnostic areas of cardiology. With 67 cardiologists, the DOC is among the largest in the country and is recognized nationally as a leader in several fields.

The structural interventional cardiology group has continued to expand, and it has streamlined the TAVI program, a joint effort between interventional cardiology and cardiac surgery. More than 150 TAVIs are implanted annually, and the TAVI clinic, led by Dr. Anna Bizios, implements a streamlined TAVI assessment that includes evaluation of frailty. Other structural procedures, such as PFO and LAA closures, have continued to grow under.

The COVID-19 pandemic continued to impact daily operational activities of the DOC citywide. Reduction in outpatient clinics and diagnostic services reached almost 90% of usual volumes during the peak of the pandemic. In

the past six months, most diagnostic clinic activities have been restored to nearly pre-pandemic levels. Despite these reductions, the strong leadership within the Department of Cardiac Sciences allowed coordination at the city level, ensuring cardiac care across the region. Several of the DOC's processes have been streamlined and adopted at the provincial level. These changes continue to be relevant and have facilitated close survey of all DOC clinical activity.

The Wellness Committee and Equity Diversity and Inclusion Committee led by Dr. Vikas Kuriachan and Dr. Michelle Keir, respectively, continue to provide important support and insight into systemic discrimination. Well Doc Alberta conducted a virtual session including DOC and Department of Cardiac Sciences. A virtual retreat took place in the early 2022. A continued priority of the DOC is new general cardiology recruits.

Cardiac Sciences Grand Rounds is the educational flagship of the Department and is very successful with high level local and international speakers participating **(see Appendix B).** The reach of Cardiac Sciences Grand Rounds has been expanded to the University of Alberta and University of British Columbia Cardiology divisions.

## *Advanced Heart Failure*

**Lead – Dr. Jonathan Howlett**

The heart failure (HF) group and cardiac function clinic follow more 17,000 patients. HF Pathways are standardized across the city, reducing hospital admissions, and improving care. Innovations such as implementation of a multidisciplinary Early Ambulatory Reduction in HF Clinic (EARLY) and personal heart failure care phone app have begun in collaboration with the Cardiac Rehabilitation Centre (Dr. Sharma, Dr. Aggarwal and Mea Sumrain, NP).

A joint EP/HF medication optimization clinic led by our first combined HF/EP fellow, Dr. Brennan Ballantyne, (who is under the Supervision of Dr. Lyons) focuses toward ensuring patient with cardiac implantable devices receive optimal care.

A national centre of excellence, the Amyloid Program of Calgary has developed and grown under the leadership of Dr. Nowell Fine, who also co-chairs a newly formed Canadian Registry for Amyloidosis Research. Advances in the diagnosis of cardiac amyloid have continued under the joint leadership of Drs. Fine and Robert Miller. Dr. Miller also leads the largest Canadian invasive heart failure remote monitoring (CardioMeMs) program.

Dr. Howlett led one of the first invasive hemodynamic stress exercise diagnostic programs in Canada. He also collaborated with Dr. Jan Storek in the Scleroderma BMT program, which is one of only two such programs in Canada. A newly created Section of Transplant Medicine was created under the leadership of Dr. Isaac, who additionally serves as the inaugural section head. Dr. Sharma, who continues his role as site lead at the Rockyview Hospital, collaborated with Nancy Clark, who was instrumental in the development of the Cardiac Nurse Practitioner program.

Building on the HF program's footprint, heart failure physicians participate in the cardio-oncology program, amyloid, hypertrophic cardiomyopathy clinics, echocardiography, nuclear and cardiac CT, cardiac cath lab, and general cardiology. The HF group continues to collaborate with other member groups in the Department of Cardiac Sciences, developing and participating in heart teams for assessment for mitraclip, cardiogenic shock. The group has made a specific new link with the adult congenital heart disease (ACHD) program for assessment of adult congenital heart patients for advanced heart failure therapies (VAD/cardiac transplant).

Nursing team members on units 81 and 82, led by Clinical Nurse Educator Stephanie Smawley, Nurse Clinician MJ CoKehyeng, and Clinical Nurse Specialist Karen Weins have shined this past year with an inpatient heart failure educational video series created to educate patients admitted to cardiology with heart failure. Cardiac Transplant RN and LVAD coordinator, Pam Demarbre, was highlighted by the Faculty of Nursing for her role in mentoring student nurses. Pam and cardiac transplant registered nurses Krista Soderberg and Collette Gibson were acknowledged for their work with the adult congenital population with a national presentation at the Canadian Council of Cardiovascular Nursing annual meeting in May 2021.

Over the past year, there have been significant increases in the volume of inpatient care, cardiac transplants, and durable mechanical assist device implantations.

Dr. Omid Kiamanesh was recruited to join the heart failure program. Dr. Kiamanesh completed cardiology training in Vancouver, fellowship training in advanced heart failure and cardiac transplantation at the University of Toronto, and a combined echo training program between the University of Toronto and the University of Calgary. He has quickly begun to accumulate leadership roles: he is the Medical Director of the Peter Lougheed Cardiac Function and Neuromuscular Clinics and serves as HF liaison to the multidisciplinary Shock Team. Dr. Kiamanesh will participate on the inpatient heart failure service, mechanical circulatory support, and cardiac transplant programs.

HF Affinity group members have significantly increased their research contributions with a combined total of 60 original publications, seven peer-reviewed grants as primary investigator (totaling $960,000 CDN) and 10 as coinvestigators (> 10M CDN), and 25 invited presentations at national or international meetings/events.

We also offer congratulations to Drs. Miller and Sharma for successful promotion to the academic rank of Clinical Associate Professor of Medicine, Cumming School of Medicine.

Other ongoing commitments include:

**Dr. Nowell Fine:**
- Co-chair of the CCS/CHFS Joint Position Statement on the Evaluation and Management of Patients with Cardiac Amyloidosis;
- Director, CCS Heart Failure Primary Panel;
- Lead, Amyloid Program of Calgary;
- Lead Department of Cardiac Sciences ECHO service affinity group.

**Dr. Jonathan Howlett:**
- CCS Primary Panel for Heart Failure Guidelines
- Co-Chair, SCN Provincial HF Working Group and the Calgary and Provincial HF Pathway Initiative
- CCS Development Committee
- CCS Guidelines Committee
- Co-Chair CHFS Annual Heart Failure Update
- Affinity Lead, Advanced Heart Failure

**Dr. Debra Isaac:**
- Secondary Panel for CCS/CCTN Joint Position Statement on Heart Transplantation
- Section and Division Head Transplant Medicine
- National COVID Transplant Committee

**Dr. Omid Kiamanesh:**
- Medical Director, Peter Lougheed Centre Cardiac Function and Neuromuscular Clinics

**Dr. Kristin Lyons:**
- Director RGH Echo
- Program Director AHF program
- CCS Council Member
- Provincial Drugs and Therapeutics Committee
- SCN POCUS Committee

**Dr. Robert Miller:**
- Lead, Cardiac Sciences Nuclear Cardiology and Cardiac CT Affinity Group

**Dr. Nakul Sharma:**
- Lead Rockyview Site
- Medical Co-Lead Calgary Zone HF Pathway Initiative

### HIGHLIGHTS

- Clinical innovation with the development of two outpatient programs aimed at improving heart failure outcomes, including the CIED/HF initiative and the HF safety clinic.
- Advanced Heart Failure Clinic for ACHD.
- Ongoing success with wireless pulmonary artery pressure monitoring technology.
- Heart Failure Pathway for PCNs.
- Active QI and Clinical Research Program with numerous industry and investigator driven clinical trials and research projects, with key involvement in pivotal clinical trials.
- Over 60 publications and for AHF members.

## *Arrhythmia & Autonomics*

**Lead – Dr. Satish Raj**
**CIED Medical Lead – Dr. Glen Sumner**
**Electrophysiology Lab Medical Lead – Dr. Stephen Wilton**
**Electrocardiography/Holter Monitor Medical Lead – Dr. Russell Quinn**

The arrhythmia group is amongst the largest academic groups in the country with 14 active adult cardiologists, one pediatric cardiologist, and one cardiac surgeon. The group provides highly specialized services for the region and on-site clinics, which include Atrial Fibrillation [AF], Cardiac Implantable Electrical Device [CIED], Genetic Arrhythmia, General Arrhythmia, and Syncope clinics, at South Health Campus (SHC) and Foothills Medical Centre (FMC), Alberta Children's Hospital (ACH; Pediatric Arrhythmia) and the Peter Lougheed Center (PLC; Adult Congenital Arrhythmia).

COVID-19 had a large impact to our service delivery model. The challenges posed by the pandemic forced us to find innovative ways to care for our patients.

### HIGHLIGHTS

The group successfully implemented same-day discharge for most device and ablation procedures at Foothills Medical Centre, including most atrial fibrillation ablations. This has now become standard process. Same-day discharge decreases stress on inpatient hospital beds and allows patients to get back to their families sooner. There have been no significant safety concerns with this approach. Reducing the demand for inpatient beds has resulted in significant savings to the health care system.

The group enhanced use of remote monitoring for our cardiac implantable electrical device (pacemaker and implantable defibrillator) patients to provide more care without making the patients come to hospital.

Dr. Derek Exner performed the first Canadian implantation of a novel, dual chamber leadless pacemaker.

Expansed use of "conduction system pacing" as both a primary method for resynchronization pacing and as a potential alternative to conventional left ventricular lead based biventricular pacing.

Worked with the Libin Precision Medicine Initiative to implement the real-world use of patient reported outcomes measures (PROMs) in the Atrial Fibrillation Clinic.

COVID related delays have led to lengthening wait times and a decrease in the overall number of ablation cases performed in 2020 . The group bounced back to perform a record number of procedures in 2021 without any additional lab time, thanks to efficient scheduling and use of available time. The group set a record for the most ablations performed in one month in Calgary. However, the waitlist has lengthened significantly, and the group is still working on long-term solutions to this problem.

The group has been performing more cases without the need for fluoroscopy (X-Ray), including the first complex pulmonary vein isolation (PVI) cases. This approach has potential advantages for both operator safety and patient safety.

Dr. Vikas Kuriachan worked with colleagues in diagnostic imaging and radiation oncology to perform stereotactic radio ablation procedure for VT in Alberta. In selected patients, this procedure can be performed in less than 30 minutes compared to several hours for traditional ablation procedures. **(See story in Appendix C).**

The AF Clinics at FMC and SHC have continued to adapt to the challenges of COVID, with SHC clinic staff being redeployed to other clinical areas for parts of 2021. Overall, the clinics saw an approximate 20 per cent reduction in the volume of clinical activities, and about 80 per cent of physician visits were remote. The clinics have continued to provide an excellent standard of care to our patients.

## RESEARCH HIGHLIGHTS

***Device Program:***

We are active in multicentre pre-and post-market studies of novel device therapies, making these cutting-edge options available to our patients.

Dr. Stephen Wilton is leading the ongoing frailty study, which evaluates outcomes in device patients who are at increased risk due to objectively identified frailty.

Dr. Glen Sumner and the Libin Health Policy Initiative are conducting an analysis of the effects of the pandemic on cardiac device patients' outcomes and the effects of remote monitoring.

Dr. Vikas Kuriachan is working with Dr. Jonathan Howlett and the Heart Function group on a quality improvement project to optimize medical therapy in people with heart failure and cardiac devices.

Atrial Fibrillation and Ablation:
We are enrolling in multiple cutting-edge studies of cardiac ablation. The AHS Strategic Clinical Network supported and PRIHS-funded, PER-DIEM study was published in the *Journal of the American Medical Association*. This randomized trial showed that implantable cardiac monitors had a higher yield for finding atrial fibrillation than external monitors following a cryptogenic stroke. The leadership of this important trial included several members of the group, including Drs. Derek Exner, Russell Quinn, and Derek Chew.

We are involved in a multicenter "upstream" study entitled "Reversal of Atrial Substrate to Prevent Atrial Fibrillation" (RASTA-AF), and Dr. Stephen Wilton is leading a Calgary-based sub-study to look at pathophysiological mechanisms of change.

***Syncope and Autonomics:***

Dr. Robert Sheldon published the results of the 4th Prevention of Syncope Trial in the Annals of Internal Medicine. This was a multicenter, international, placebo-controlled randomized trial of midodrine vs placebo. This is the first rigorous trial to show a benefit for a pharmacological treatment in vasovagal syncope.

Dr. Robert Sheldon published the Syncope: Pacing or Recording in the Later Years (SPRITELY) study, which was an international pragmatic study randomizing older patients with syncope and fascicular block to an initial pacemaker or implantable cardiac monitor.

Dr. Satish Raj and colleagues published separate randomized crossover trials of compression garments and augmented dietary sodium intake for patients with Postural Orthostatic Tachycardia Syndrome (POTS) in the *Journal of the American College of Cardiology*. **(See story in Appendix C).**

Dr. Satish Raj and colleagues published a series of papers defining the physiology underlying Initial Orthostatic Hypotension (IOH) and potential treatments for IOH in the *Journal of the American College of Cardiology, Hypertension, and Heart Rhythm.*

## AWARDS

Dr. Anne Gillis received the 2021 Lifetime Achievement Award from the Canadian Heart Rhythm Society. (**See story in Appendix C**).

Dr. Jacques Rizkallah received the 2021 – 2022 University of Calgary Students' Union Teaching Excellence Award for his work as the Course 3 Director for the Cardiovascular Section for the medical students. Importantly, this is an award voted on by the students.

## RETIREMENTS

Dr. L. Brent Mitchell, Founding Head of the Department of Cardiac Sciences and Founding Director of the Libin Cardiovascular Institute, retired from clinical practice in 2021.

Dr. Anne M Gillis, Former Training Program Director, Former Medical Director for the Cardiac Implantable Electrical Device Clinic, and Past-President of the Heart Rhythm Society, retired from clinical practice in 2021.

## RECRUITMENT

We were fortunate to be able to recruit Dr. Derek S. Chew to join our group. Derek proved himself to be an excellent clinician during his training in Calgary. In addition to his clinical expertise, Derek has a Master of Science in Health Economics degree from the London School of Economics. Prior to joining our group, Derek was a Research Fellow at the Duke Clinical Research Center.

## IN MEMORIUM

The electrophysiology group was saddened by the loss of our esteemed colleague and mentor Dr. D. George Wyse. Dr. Wyse was the founder of the electrophysiology group at the University of Calgary, a former Chief of the Section of Cardiology, and a former Associate Dean for Clinical Affairs at the School of Medicine. More importantly, he was a teacher, a mentor, and a friend to many in our faculty (and elsewhere). He remains an inspiration to all members of our group due to his foundational leadership in research and high-quality clinical care.

# *Echocardiography*

**Zone Medical Director – Dr. Nowell Fine**
**Foothills Medical Center Site Lead – Dr. Sarah Weeks**
**Peter Lougheed Center Site Lead – Dr. Jill Colbert**
**Rockyview General Hospital Site Lead – Dr. Kristin Lyons**
**South Health Campus Site Lead – Dr. Patrick Champagne**
**Clinical Fellowship Program Director – Dr. Jill Colbert**
**Education Director – Dr. Stephen Reynolds**

## MEMBERS UPDATE

The Echocardiography (Echo) Laboratory (Lab) is one of the largest laboratories in the country, with more than 20,000 tests performed citywide. The Lab offers comprehensive services including inpatient and ambulatory transthoracic echo, transesophageal echo, exercise and pharmacologic stress echo, contrast echo, and pericardiocentesis. The Echo Lab offers 24-hour per day, 7-days per week service to the Calgary Zone.

Dr. Omid Kiamanesh was recruited to join the Section of Cardiology as an attending echocardiologist in July 2021. He also has an interest in POCUS and echocardiography evaluation of right heart function.

Dr. Nathan Leader will be completing his level III echocardiography fellowship in June 2022. Dr. Jessica Patzer will begin her level III echocardiography fellow in July 2022. Dr. Patzer completed adult cardiology residency training in Calgary and is completing adult congenital heart disease fellowship training in Toronto.

## HIGHLIGHTS

Dr. Omid Kiamanesh (trainee member), Ms. Heather Cooley (sonographer member) and Dr. Nowell Fine are members of the Canadian Society of Echocardiography (CSE) Board of Directors. They all presented at the CSE Annual Echo Weekend 2022 (held virtually this year). Dr. Fine also serves on the American Society of Echocardiography Image Guide Echo Registry Research and Publications Committee.

Dr. Kristin Lyons is a member of the Canadian Cardiovascular Society Council.

Dr. Michelle Keir is co-director of the Calgary Aortic Program and lead for the Department of Cardiac Sciences and Libin Cardiovascular Institute Equity, Diversity and Inclusion committee.

## *Foothills Interventional Cardiology Service (FICS)*

**Lead – Dr. Michael Curtis**

The major focus of the Cardiac Catheterization Laboratories and FICS group has been coping with the loss of Catheterization Lab 6 which has been inoperable since August of 2020 with its expected replacement hopefully sometime this fall. Unfortunately, the relief will be brief as immediately we will embark on the replacement of room two.

## *Nuclear*

**Lead – Dr. Robert Miller**

### MEMBERS UPDATE

The nuclear cardiology / CT group has continued to provide its clinical services across the city and provides both nuclear and CT testing at the Foothills Medical Centre and South Health Campus sites. The group performs more than 1,900 nuclear tests annually. The group has actively been expanding its capacity for coronary computed tomographic angiography (CCTA), with an increase in test volume from 1,757 last year to over 2,400 tests this year. The group recently streamlined the process for inpatient CCTA, making it simpler for referring physicians. Additionally, we have created new mechanisms to re-book patients who are beta-blocker resistant to expedite testing. As a result of these changes, the group's ability to provide CCTA has improved with significant reduction in wait times.

The group also expanded capacity for technetium pyrophosphate testing, which is a highly accurate method for identifying patients with transthyretin cardiac amyloidosis. Our technetium pyrophosphate imaging program is one of the largest in the country, and we are leveraging our expertise to help centers in Western Canada to improve image acquisition and interpretation. Additionally, members have presented on methods to improve technetium pyrophosphate image acquisition and interpretation at several national and international meetings.

### LEADERSHIP POSITIONS

Our group has continued to play an integral role in professional societies. Dr. Mustapha Kazmi is the current president of the Canadian Society of Cardiovascular Nuclear and CT Imaging.

### AWARDS

Dr. Robert Miller was awarded the Hal O'Brien Rising Star award from the Society of Nuclear Medicine and Molecular Imaging and the Young Investigator Award from the American Society of Nuclear Cardiology. **See Appendix C for story.**

### RESEARCH ACTIVITIES

Initiation of the multicenter, Canadian Pyrophosphate Registry (CAPER) which aims to improve disease diagnosis and risk stratification in patients with transthyretin cardiac amyloidosis.

Participation in the NIH-funded, international multi-center registry of Fast Myocardial Perfusion Imaging with next generation SPECT (REFINE SPECT), which aims to improve disease diagnosis and risk stratification following SPECT MPI.

More than 20 manuscript publications. A few recent manuscripts include:

- "Quantitative Cardiovascular Magnetic Resonance and Technetium Pyrophosphate Imaging in Patients with Suspected Cardiac Amyloidosis." *Journal of Nuclear Cardiology.*
- "Prediction of major adverse cardiac events using minimum features in machine learning: results from REFINE SPECT registry." *Cardiovascular Research.*
- "Clinical deployment of Explainable Deep Learning to Improve Myocardial Perfusion Imaging." *JACC Cardiovascular Imaging*

## *Adult Congenital Heart Disease*

**Lead – Dr. Michelle Keir**

### MEMBER UPDATE

The Adult Congenital Heart Disease clinic has continued to expand to accommodate an increase in the number of adults with complex congenital heart disease in Southern Alberta. With funding from the Alberta Children's Hospital Research Institute and the Libin Cardiovascular Institute, the group has conducted focus groups with CHD patients to determine research priorities and developed a participatory action research network. We are now investigating the role of advance-care planning in ACHD care. We are pleased that Dr. Nanette Alvarez has now returned to the clinic after her sabbatical.

### HIGHLIGHTS

Funding award from the Alberta Children's Hospital Research Fund to investigate advance care planning in ACHD.

## *Cardiac Magnetic Resonance (CMR)*

**Lead – Dr. James White**

### OVERVIEW OF THE STEPHENSON CARDIAC IMAGING CENTRE:

The Stephenson Cardiac Imaging Centre is a clinical academic program benefitting from two cardiac dedicated MRI units at the Foothills Medical Centre and South Health Campus. This integrated program is supported through a unique collaboration of the Departments of Diagnostic Imaging and Cardiac Sciences at the Cummings School of Medicine, Alberta Health Services, and the Libin Cardiovascular Institute. With equally prioritized clinical, educational, and academic mandates, Centre activities are coordinated by an academic director with clinical co-directorship from each department. With progressive growth, the Stephenson Cardiac Imaging Centre now delivers over 4,000 cardiac MRI studies per year for patients of Southern Alberta and leverages this high-volume clinical service to enable large scale data collection that drive translational cohort studies and data-driven personalized care initiatives.

### CLINICAL PROGRAM PROFILE

The Stephenson CMR program uses state-of-the-art MRI equipment with a dedicated Siemens 3.0 T PRISMA magnet at FMC and a wide-bore Siemens 3.0T Skyra at SHC. A variety of advanced cardiac imaging services are provided at both sites, augmented with specialized programs for stress-perfusion imaging, adult-congenital heart disease, and aortopathies. Clinical CMR volumes have expanded over the past 12 months with approximately 4,400 imaging examinations performed, making it one of the busiest clinical CMR services in North America. We were able to increase our capacity by expanding clinical services to weekends to reduce wait times. The distribution of referral indications remains similar: Ischemic cardiomyopathy: 25%, Non-ischemic cardiomyopathy: 35%, Cardio-oncology 14%, Stress perfusion: 12%, Congenital / valvular heart disease: 12%, and Pulmonary Vein MRA: 10%.

### CLINICAL SERVICE INNOVATION

To prepare for the launch of the AHS Connect Care project, we implemented a new system of reporting/workflow to improve standardized data capture in Cardiac MRI that will leverage complementary resources from EPIC / Connect Care. Dedicated working groups in CT and MRI are working with the Connect Care team to integrate our unique clinical reporting systems with the new clinical and research pathways in Connect Care. As a strategic innovation project of AHS, this will be targeted for implementation with Launch 5 deployment of the Connect Care program. In conjunction with the established CIROC-CMR/CT registries, it aims to deliver unprecedented support of QA/QI programs and catalyze local research and development efforts surrounding data-driven tools for improving both efficiency and value in diagnostic imaging.

We continue to expand our pilot program for improving access to MRI for patients with cardiac implantable electrical devices (CIEDs) like pacemakers and ICDs. This includes patients with both devices that are deemed MRI compatible and well as those that are not approved as MRI compatible. Following literature guidelines, strict screening algorithms, and joint workflows in DI and the Electrophysiology group, we have triaged over 200 patients. Over 60 patients who had not previously had access to MRI, have now been scanned in the 1.5T FMC scanners, without complication.

QI projects continue with focussed attention paid to scan efficiency, protocol optimization, pre/post scan workflow, and standardized reporting. Regular dedicated readers meetings have been occurring throughout the year, with attention on optimizing exam quality and efficiency, and maximizing the use of resources in the centre for all clinical and research staff.

### RESEARCH INNOVATION AND ACADEMIC GROWTH

With the Stephenson Centre's core academic mandate of delivering research-grade data in real-world clinical practice, we aim to support a broad range of academic activities for clinicians and researchers within the Libin Cardiovascular Institute. Curated data resources are available based upon disease-focussed cohort definitions. With routine engagement of patients to participate in the REB-approved Cardiovascular Imaging Registry of Calgary (CIROC), raw and curated tabular diagnostic data has been linked to all health data repositories across the Province of Alberta for over 26,000 Cardiac MRI and 6,000 Cardiac CTA patient encounters. The Personalized Diagnostics Program (PDP), led by Dr White, aims to leverage this high-quality data to deliver artificial intelligence-based solutions for clinically relevant challenges in cardiovascular disease. This work involves partnerships with Departments of Computer Sciences, Biomedical Engineering, O'Brien Institute for Public Health, and the Alberta Machine Intelligence Institute (AMII).

To support these activities, investigators of the Stephenson Centre have developed and supported the clinical implementation of innovative software solutions for the analysis of cardiac imaging datasets, patient engagement, standardization of clinical workflow, and data collection. Ongoing development of four-dimensional cardiac deformation analysis software and 4D-flow modelling continues to accelerate the Centre's international innovation footprint. The Centre has also established strong partnerships with Siemens with numerous projects surrounding pulse sequence development and validation.

Over the past year, the Centre has seen great success in peer-reviewed funding to support innovation. Dr. White received a $1.1 million CIHR grant to support a multi-national study validating AI-based diagnosis and risk prediction in cardiomyopathies across geographically and ethnically diverse environments. **(See Appendix C for story).** Two grant funding awards were obtained from Pfizer and from CCS-Pfizer to support AI-development of echocardiography-based disease classification and response to therapy in patients with ATTR Cardiac Amyloidosis, work being performed in partnership with Dr. Nowell Fine. Numerous incremental local and multi-centre grant-funded studies also launched through collaborations with Libin investigator as well as with investigators from other Canadian academic institutions. These latter studies include evaluations of post-COVID syndrome, Microvascular angina, Postural Orthostatic Hypotension Syndrome (POTS), and Fabry disease. Dr. Julio Garcia continues to lead a preclinical research program on 4D Flow MRI with projects focussed on atrial fibrillation, mitral valve disease, aortopathy and congenital heart disease. Pre-clinical research support extends to Dr. Paul Fedak's laboratory assessing MRI-based markers of remodelling following myocardial infarction. Finally, growth in core laboratory services are appreciated through collaborative research engaged by Dr. Bobby Heydari and Dr. Naeem Merchant with US-based sites. The Stephenson Centre academic team includes two clinical fellows, three PhD students, five masters students, six undergraduate research students, three post-doctoral research fellows, a research assistant, research nurse, research collaborations coordinator, and research administrator.

The Centre's research productivity remains high with over 30 publications over the past year, including those published in high impact journals such as the *Journal of the American Heart Association (JAHA), Circulation, Journal of the American College of Cardiology (JACC), Circulation: Cardiovascular Imaging, Nature Scientific reports, Medical Physics, and Magnetic Resonance in Medicine (MRM).*

## *CARDIAC SURGERY*

**Section Chief – Dr. Bill Kidd**

The Section continues to thrive in all areas including clinical, teaching and research. In addition to adult cardiac surgery, the section members in a team-based approach perform minimally invasive valve surgery, transcatheter aortic valve replacement, Maze procedure, standard and complex aortic surgery, ventricular assist device insertions, pacemakers, arterial revascularizations for CAD, PDA ligations, and others. The residency program is one of the best in Canada with many highly qualified applicants, a program known for an environment of collaboration, and a culture of diversity and inclusivity. Research is up-and-coming with a quarterly meeting and many surgeon/resident-led projects.

The Section and its leadership are committed to a culture of collaboration and teamwork. The Section is also indebted to the Libin Cardiovascular Institute for its ongoing support in many areas.

### *Minimally Invasive Cardiac Surgery (MICS)*

**Lead – Dr. William Kent**

This innovative program continues to expand, with surgeons: Drs. Dan Holloway, Corey Adams and William Kent all specializing in leading-edge minimally invasive surgical techniques. As the program has increased its volume, minimally invasive aortic valve replacement and mitral valve repair are now offered for most patients in Calgary. By using sternum-sparing small incisions and thoracoscopic instrumentation, valves are repaired or replaced, and atrial septal defects are closed. In addition, minimally invasive coronary artery bypass surgery will be introduced this coming year. With these minimally invasive approaches, patients gain the benefits of less pain, less blood transfusion, less time in hospital, and a quicker return to normal activity.

This past year, we became the second centre in Canada to perform the beating heart NeoChord procedure, an innovative technique to repair the mitral valve without the use of cardiopulmonary bypass. **(See story in Appendix C)**. Our centre hosted the Inaugural Western Canadian Minimally Invasive Valve Meeting, which was attended by surgeons interested in learning minimally invasive techniques. Our dedicated Valve Clinic at the South Health Campus has expanded with the support of Cardiologist Dr. Jill Colbert and Nurse Clinician Deborah Lundberg, and we are expanding our clinical research contributions by participating in several important valve surgery clinical trials. We have also initiated a prospective trial measuring both conventional qualitative outcome measures, in addition to qualitative outcomes like quality of life, pain, and postoperative mobility after minimally invasive surgery.

## *Aortic Program*

**Co-leads – Drs. Scott McClure, Randy Moore, Michelle Keir, Eric Herget**

The Calgary Aortic Program (CAP) represents a multidisciplinary team of clinicians and researchers invested in the management of complex aortic disease. The citywide, zonal initiative draws upon the expertise of several specialties: cardiac and vascular surgery, cardiology, interventional radiology, anaesthesia, intensive care, genetics, biomedical engineering, and others, all focused on the improvement of aortic health within the Calgary Zone.

CAP continues to build upon its early successes. The multidisciplinary Complex Aortic Clinic at the South Health Campus, now in its third year, has been a true success. This multispecialty clinic fields referrals for all aortic disease inquiries. It provides a one-stop shop to clinical decision-making and is an added convenience to patients, as several specialty clinicians can be seen at a single visit.

CAP continues its innovative pursuits, leading the way with respect to less invasive endovascular treatments for aortic arch disease. The CAP team recently completed the first two cases in Canada using the Gore TBE endovascular arch branch device. The CAP team was also the first team in Canada to perform total endovascular arch reconstruction with the Terumo Relay® Branch endograft device (See story in Appendix). Both devices provide a less invasive solution to complex aortic pathologies. The CAP team's selection as the first Canadian site to use these devices is a testament to industries support of the multidisciplinary CAP philosophy. The program will continue to build and lead in this exciting area of aortic disease management. Coinciding with these successes, open thoracoabdominal aortic volumes are also on an upward trajectory at our centres. Providing broad expertise for both complex open and endovascular care is the fundamental premise behind the CAP approach.

There are also many clinical and basic science research initiatives currently underway at CAP. Taken together, it's been a productive and fruitful year for the program.

# *MULTIDISCIPLINARY DEPARTMENTAL PROGRAMS*

## *Mechanical Circulatory Support*

**Medical Lead – Dr. Jonathan Howlett**
**Surgical Lead – Dr. William Kent**

Patients with advanced heart failure represent a growing population and the Mechanical Circulatory Support Program, led by Cardiologist Dr. Jonathan Howlett and Cardiac Surgeon Dr. William Kent, provides both medical and surgical therapy for these critically ill patients. Using implantable pumps for temporary and long-term support, patients with end-stage heart failure can be stabilized until they recover cardiac function or receive a heart transplant.

The program has focused on minimally invasive strategies to reduce the risk of surgical intervention and Foothills Medical Centre was the first centre in Canada to implant the HeartMate 3 left ventricular assist device (LVAD) with a bilateral mini-thoracotomy approach. The HeartMate 3 is the latest generation of durable LVAD, which allows patients to continue active lives until a heart transplant becomes available. The program also uses ECMO and Impella devices to support patients who present acutely in cardiogenic shock. The Centri-Mag pump is also used for acutely ill patients who require more prolonged support before a durable LVAD can be implanted or a donor heart procured.

The Mechanical Circulatory Support Program applies a team-based multi-disciplinary approach to the care of heart failure patients. The group is presently involved in many clinical trials. Researcher and Departmental Head, Dr. Paul Fedak, directs a translational research laboratory with a goal to develop innovative therapies, such as epicardial infarct repair, which may eventually restore function to the damaged myocardium of heart failure patients.

## *Transcatheter Aortic Valve Implantation (TAVI)*

**Surgical Lead - Dr. Anna Bizios**

The TAVI (Transcatheter Aortic Valve Implantation) and Structural Heart Program has seen ongoing success and growth over the past year. An influx of referrals coming out of the COVID-19 pandemic resulted in increased demand for the life-saving procedure here in Calgary. Low and intermediate risk patients ages 75 years and older are now eligible for TAVI as per national and international guidelines.

This past year, a total of 192 TAVIs were performed (a marked increase from 135 TAVIs last year). This included 173 transfemoral and 19 alternate access cases. Numerous "valve-in-valve" TAVIs were performed, allowing patients to avoid redo sternotomy for failing bioprosthetic aortic valves. Multidisciplinary TAVI team rounds are held regularly to facilitate collaborative and patient-centred decision making.

We were very fortunate to welcome Ms. Farhana Khanam

onto the TAVI and Structural Heart team. Ms. Khanam plays an integral role in administrative support for our extremely busy and growing program. Ms. Annette Gourlay, Structural Heart and TAVI coordinator, continues to do a phenomenal job directing patients and their physicians through their work-ups, procedures and follow-up.

In addition to the TAVI program, there were 22 ASD/PFO percutaneous closures performed this year. Other interventions included percutaneous aortic paravalvular leak repair and hybrid-approach post-infarct ventricular septal defect repair.

In the coming year, we look forward to our program's continued expansion. We are in the process of streamlining our post-TAVI care pathways in anticipation of further rapid growth and are keen to expand interventions to include, amongst others, transcatheter mitral valve-in-valve (or valve-in-ring) interventions.

## *CARDIAC ANAESTHESIA*

**Director – Dr. Chris Prusinkiewicz**

### CLINICAL PRACTICE

CAG members work in a multidisciplinary environment to provide anesthetic care for a variety of cases in an increasingly elderly and complex patient population. Anesthesia services are provided for open-heart surgery, off-pump coronary artery bypass grafting, aortic reconstruction including deep hypothermic circulatory arrest, mechanical assist device support, total endovascular aortic repair, minimally invasive valve surgery, and complex pacemaker / implantable defibrillator lead extractions. Outside the cardiac operating rooms, group members provide anesthetics in the cardiac catheterization laboratories for both electrophysiology procedures and for percutaneous structural heart procedures such as transcatheter aortic valve implantations, atrial septal defect closures, perivalvular leak closures, valvuloplasties, and left atrial occlusion device insertions. Upon request, members also provide care to patients with complex cardiac disease undergoing non-cardiac surgery. Outpatients awaiting heart surgery are reviewed by cardiac anesthesiologists at the weekly preadmission clinic, while inpatients receive preoperative assessments by cardiac anesthesiologists on an ongoing basis.

Demand remains high for cardiac anesthesia services. In addition to the group's typical responsibilities, during the COVID pandemic CAG group members have provided surge coverage in the intensive care unit and continue to serve on the ECMO team. The ECMO team is a multi-disciplinary group composed of surgeons, intensivists, anesthesiologists, nurses, perfusionists, and respiratory therapists, which inserts and manages extra-corporeal membrane oxygenation machines in patients failing traditional ICU ventilator therapy. With the advent of the cardiology shock team this year, CAG members are also providing coverage for the insertion of mechanical circulatory support devices in certain patients suffering from cardiogenic shock.

### EDUCATION

CAG members strive to provide the highest standard of clinical education, and numerous members have been recipients of teaching accolades over the years. Anesthesia residents complete two blocks of cardiac anesthesia in their fourth year, plus a block in the cardiac surgical ICU. Off-service trainees rotating with the CAG include fellows from critical care medicine, cardiology, perioperative ultrasound, and cardiac surgery residents. CAG members also provide didactic teaching for the anesthesia residency cardiovascular core program on a biannual basis. Computer-based learning is available through the TeachingMedicine.com website, which is designed by group member, Dr. Jason Waechter, and includes modules on transthoracic and transesophageal echocardiography.

### RESEARCH AND QUALITY IMPROVEMENT

The CAG has an active research program with numerous publications. Highlights include recent publications by Dr. Gregory in the Journal of Thoracic & Cardiovascular Surgery, Journal of Cardiothoracic & Vascular Anesthesia, Journal of Cardiac Surgery, and the World Journal of Surgery (among others).

Dr. Seal is the project holder of the Foothills Medical Centre Staff Anesthesia Research Fund. The fund was established through the generosity of Dr. Tim Tang, a former CAG member, and was developed to promote research in the areas of cardiac anesthesia, patient outcomes, and quality improvement.

Ongoing research and quality improvement projects with CAG involvement include:

- TITAN SvS: Treatment in thoracic aortic aneurysm comparing surgery vs surveillance
- NEWTON-CABG: Effect of Evolocumab on saphenous vein graft patency following coronary artery bypass surgery
- REVERSE-IT: Bentracimab (PB2452) in Ticagrelor-treated patients with uncontrolled major or life-threatening bleeding or requiring urgent surgery or invasive procedure
- Role of valve-mediated hemodynamics on bicuspid aortopathy

- PREPARE Trial: Exercise before surgery to improve recovery in older people with frailty
- On-X aortic prosthetic heart valve low dose warfarin post approval clinical registry study
- ERAS-CV: Enhanced recovery following cardiac surgery, a pilot study of implementing a new clinical pathway and retrospective cohort analysis
- Use of point-of-care coagulation testing in cardiac surgery to decrease blood product wastage, save system costs, and improve patient outcomes: quality improvement project
- Recently completed research projects with CAG involvement include:
- CAMRA-1 (Canadian Mitral Research Alliance): A randomized trial of mitral valve repair with leaflet resection versus leaflet preservation on functional mitral stenosis
- Impact of heparin and cardiopulmonary bypass on platelet function determined by procoagulant membrane dynamics analysis
- Neurologic outcomes in aortic aneurysm surgery: an observational study
- Enhanced Recovery After Cardiac Surgery

The CAG continues to be involved in the implementation of an enhanced recovery after cardiac surgery (ERACS) program. The goal of the ERACS program is to improve patient comfort and outcomes, as well as to decrease the length of hospital stay. ERACS implementation involves a multidisciplinary team of health-care professionals including anesthesiologists, surgeons, intensivists, and nurses. The ERACS pathway was successfully launched in Calgary in the summer of 2019. Data-analysis is ongoing to determine the impact of ERACS interventions on outcomes, and aid in the design of further interventions.

## PERIOPERATIVE BLOOD MANAGEMENT

Despite steady improvements over the last decade, cardiac surgery continues to have a high rate of blood transfusion compared to other types of procedures. Preoperative anemia significantly increases a patient's chance of requiring perioperative blood products and the risk of transfusion-related complications. The Perioperative Blood Conservation Initiative is ongoing to help identify and treat patients with preoperative iron deficiency anemia, using either oral or intravenous iron. The algorithm also contains a provision for the use of erythropoietin in a select patient cohort. Dr. Seal is the cardiac anesthesia blood conservation lead and works closely with personnel from the citywide perioperative blood conservation program including Dr. Loraine Chow and nurse Rebecca Rock. Post-operative coagulopathy is a contributing factor to the need for blood transfusions in cardiac surgical patients. Point of care testing (POCT) may help to quickly identify whether a coagulopathy is present, and its cause. Through a joint effort between cardiac anesthesia, cardiac surgery, and cardiac surgical ICU, funding was previously secured for a quality improvement project to use POCT to decrease blood product use and wastage in cardiac surgical patients. The cardiac surgical perioperative group is currently working with Alberta Precision Laboratories to validate the newly arrived POCT machines, and the POCT quality improvement initiative is expected to fully launch in the summer of 2022.

## LEADERSHIP IN MINIMALLY INVASIVE SURGERY

Cardiac anesthesiologists, Drs. Nicole Webb and Christopher Noss, are actively supporting the new cardiac surgical NeoChord program. The NeoChord procedure is a novel minimally invasive mitral valve operation, performed on a beating heart and off cardiopulmonary bypass. As the program expands, more members of the CAG are expected to participate in the care of patients coming for this procedure.

A different minimally invasive mitral valve surgery, which is performed through a right mini-thoracotomy incision, has a long track record of success in Calgary. Cardiac teams from other centers are coming to Calgary to learn more about this procedure, and Dr. Duc Ha is providing mentorship to visiting cardiac anesthesiologists who wish to learn more about the anesthetic management and echocardiographic examination for this type of surgery.

## PERIOPERATIVE PAIN MANAGEMENT

The expansion of the minimally invasive cardiac surgical program has resulted in an increased use of right mini-thoracotomy incisions in patients. To help manage pain and improve patient satisfaction in this surgical population, the CAG employs nerve block techniques and indwelling local anesthetic catheters. These interventions carry on the spirit of the CAG's innovative approach to perioperative analgesia.

## CARDIAC ANESTHESIA FUTURE OPPORTUNITIES

- Support the continued growth of the CAG research and quality programs.
- Participate in an expanding mechanical cardiac support program for patients in cardiogenic shock.
- Provide care for novel cardiac surgical and interventional procedures.

### CARDIAC ANESTHESIA FUTURE CHALLENGES

- Help our non-cardiac anesthesia colleagues meet increased anesthesia manpower demands in non-cardiac surgery, in response to the Alberta Surgical Initiative.
- Maintain the wellness of CAG members in the setting of long and sometimes unpredictable workdays.
- Work through current supply chain disruptions impacting anesthesia disposables and equipment.

## *CARDIAC CRITICAL CARE*

**Director – Dr. Ken Parhar**

### OVERVIEW

The Cardiovascular Intensive Care (CVICU) provides high-quality care for post-cardiac surgery patients. This can only happen with the amazing dedication, teamwork, and collaboration of all the departments and multidisciplinary teams involved throughout the cardiac surgery patients' journey. The unit has a total of 22 beds on two separate units (U94 and U104) with 16 of these beds currently funded.

The CVICU at the Foothills Medical Centre serves Southern Alberta with over 1,400 cardiac surgery cases in 2021. The CVICU specializes in post-operative open-heart surgery with most cases being Coronary Artery Bypass Graft (CABG) and valve repair or replacement. Other advanced surgeries cared for in the CVICU include complex thoracic aortic surgery; minimally invasive valve surgery including alternate approaches to femoral based Transcatheter Aortic Valve Replacement (TAVI); Extracorporeal Life Support (ECLS) for both temporary heart and lung support (VV/VA ECMO); and Ventricular Assist Devices (VAD), which provide short term and more durable heart support.

### PATIENT CARE

The CVICU multidisciplinary team, in particular the nursing team, has remained busy. In addition to caring for post-cardiac surgical patients, the team has played an essential role in the care of the COVID-19 patients during the pandemic. In addition to co-managing the COVID-19 patients admitted to the general systems ICU at FMC, CVICU nurses were deployed to assist with the additional nursing of patients in the general systems ICU or to take care of general systems patients transferred to CVICU. Team members are commended for their hard work, courage, and dedication to provide care during the pandemic.

The CVICU consists of a large multidisciplinary team including registered nurses, registered respiratory therapists, cardiac surgeons, cardiac anesthetists, cardiovascular intensivists (many of whom have advanced training in ECHO and ECLS), physiotherapists, clinical pharmacists, and many allied health care providers (unit clerks, health care aids, housekeeping staff, social workers). CVICU has the highest number of advanced certifications in critical care including IABP, CRRT, three VAD devices, pulmonary artery catheters, advanced pacing, lumbar drains, and other ICU advanced certifications.

### QUALITY IMPROVEMENT AND RESEARCH

Our dynamic multidisciplinary CVICU team continues work on quality improvement and research projects including:

- Relaunch of the Patient Flow Project – Optimizing patient flow from CVICU to cardiac surgery ward Unit 91. The goal is to improve the flow of patients from the CVICU to unit 91.
- Preparation for the SMART-BP study, which will examine the use of wireless, non-invasive, real-time blood pressure monitoring and compare it to invasive blood pressure monitoring.
- Participation in the Venting Wisely initiative, a pan-provincial initiative to optimize the care provided to patients who are mechanically ventilated with hypoxemic respiratory failure and ARDS using a multidisciplinary evidence informed care pathway.
- Creation of a high-resolution (5D-ICU) quality improvement database for postoperative cardiac surgery patients with the goal of eliminating unnecessary variability in care.

### EDUCATION

The CVICU has a very robust, clinically engaged process for educating our nurses. The extensive advanced certifications require initial certification and annual recertification provided by the CVICU clinical nurse educator Chris Coltman. All new ICU nurses are part of the Department of Critical Care mentorship program. This program has been customized for CVICU and provides a supportive learning environment to allow nurses to become independent and highly skilled.

The CVICU is heavily involved in a simulation program. The purchase of a specialized mannequin has enhanced the learning experience for emergent post-operative procedures. In addition, the CVICU undertook extensive simulation of the safe ECLS cannulation COVID-19 patients using PPE and a new cannulation protocol. The simulation

involved members of the entire team, including cardiac surgeons, cardiac anesthetists, cardiovascular intensivists, operating room nurses, anesthesia and non-anesthesia respiratory therapists, and multidisciplinary colleagues from the general systems ICU. Simulation in 2022 will be expanded to accidental hypothermia, cardiac catheterization lab, and CVICU ECLS emergencies.

In 2022, we welcome our first advanced CVICU fellow through a Clinical Scholar program with the Department of Critical Care Medicine. The goal of this program will be to help train future cardiovascular intensive care physicians.

# SITES

The Department of Cardiac Sciences operates in four acute care facilities across the Zone: Foothills Medical Centre (FMC), Peter Lougheed Centre (PLC), Rockyview General Hospital (RGH), and the South Health Campus (SHC). The following section provides site-specific highlights from the past year.

## *Foothills Medical Centre (FMC)*

**Executive Director – Amanda Weiss**

*Medical Cardiology – Units 81 & 82*

There has been a change in management and leadership with the teams that has resulted in a new level of staff engagement. This has been particularly valuable as the teams worked through many new and rapidly changing processes as part of the COVID-19 pandemic response. In addition, the number of patient days within the Cardiac Intensive Care Unit has decreased for specific patient populations thanks to the recently expanded telemetry monitoring capacity in the Cardiac High Observation Area. The team continues to discuss the future of remote monitoring of high-risk patients and innovative approaches to further decrease the length of stay for various patient populations served within Medical Cardiology.

*Cardiac Intensive Care Unit – Unit 103A, CICU*

The CICU has worked closely with partners across the Calgary Zone to create additional critical care treatment spaces as part of the COVID-19 pandemic response. This is a testament to the adaptability, commitment, diligence, and expertise of the multi-disciplinary team that serves the department.

The CICU continues to engage with the Southern Alberta Organ and Tissue Donation Program to further the DCD (Donation after Cardiac Death) process. This process provides the opportunity, in appropriate cases, for organ donation in situations where the prognosis is poor and life-sustaining treatments will be discontinued. DCD helps increase the number of kidneys and other organs available for transplant.

CICU continues to support the trans-aortic valve replacement (TAVI program, and the team is seeing more patients coming to CICU post implant. These patients are mobilized early after admission and many can go home one day post-op.

*Cardiovascular Intensive Care Unit – Unit 94, CVICU*

The CVICU values its commitment to patient and family care and has worked to further refine various initiatives, including new admit-on-date-of-procedure processes, leader rounding, and a pager system for families of patients in the CVOR. Ongoing projects include working with PCU 91 on streamlining transfer processes from PCU91 to CVICU, and Enhanced Recovery After Cardiac Surgery (ERAS).

*Cardiac Surgery – Unit 91*

Unit 91 contains 38 beds that include a 12-bed telemetry area to receive patients from the CVICU 24-48 hours after cardiac surgery. The process Keep Your Move In the Tube promotes greater use of upper extremities while limiting range of motion. PCU 91 continues to work on Quality Improvement, formalizing a committee and key performance indicators for 2021. PCU91 has also been engaged in functional programming as a preliminary phase to expanding the telemetry services available on the unit to achieve greater CV surgery volumes.

## *Peter Lougheed Centre (PLC)*

**Executive Director – Emma Foltz**
**Site Lead – Dr. Michelle Keir**

*Wave 4 Connect Care launch*

The PLC is included in Launch 4 implementation of Connect Care, which launched May 28, 2022. The worked hard to ensure a smooth transition and implementation phase at our site. PLC was the first adult site in Calgary to go live, and the team looks forward to the seamless transition of accessible provincial patient information once all waves are complete.

*Unit 48 – Coronary Care Unit (CCU)*

Unit 48 is a six-bed, stand-alone CCU. Due to the pandemic response and overall cardiology acuity and occupancy, Unit 48 occupancy has been high this past year. PLC CCU worked in collaboration with the PLC Intensive Care Unit to provide support in specific instances for appropriate patients. As part of our pandemic response, CCU patients and staff members were relocated to Unit 49 for several months in the fall of 2021. This allowed additional space for expansion of the ICU to care for critically ill patients with Covid-19.

*Unit 49 – Medical Cardiology*

Unit 49 is a 32-bed inpatient medicine unit with a specialty mix of medical cardiology and internal medicine. The PLC site will be participating in a collaboration with the strategic clinical network over the next year related to quality improvement. The intent is for this work to spread throughout the Calgary Zone and province once Connect Care is fully implemented. The Royal Alex is the Edmonton site participating in this exciting work.

*CV Labs*

The pandemic has presented challenges to outpatient clinics and diagnostic areas with numerous patient appointments remaining virtual. Physicians continue to conduct some visits on the telephone, and the team has been very adaptable and resilient.

The Congenital Heart Clinic continues to see growth in its patient base. Over the last year, aortopathy referrals have grown significantly in number and complexity due to improvements in genetic testing. The congenital heart team has seen great success and growth in the multidisciplinary congenital clinic. Numerous disciplines in this clinic include nursing, congenital cardiology, hepatology, pulmonology, and social work. The congenital clinic has put efforts into improvement of Goals of Care discussions with our patients. We have recently developed a video for patients in partnership with the Libin Cardiovascular Institute and are enrolling patients for a research study related to goals of care and end-of-life planning.

The Cardiac Function clinic has been very busy over the past year providing care to a growing patient population. We are advocating for more staff to provide this specialized care to an even larger patient population. Clinic site leadership has recently transitioned to Dr. Omid Kiamanesh.

The team is working creatively to support retention of casual staff and overall recruitment of sonographer staff members in electrophysiology within the Calgary zone. We continue to be the only location within the zone to support echo testing of the adult congenital heart population.

## *Rockyview General Hospital (RGH)*

**Executive Director – Jenny Mazuryk**
**Executive Director, CCU – Teresa Thurber**
**Site Lead – Dr. Nakul Sharma**

*Unit 71*

Unit 71 has continued to support the Calgary Zone response to COVID-19 over the last year. Our four-bed Acute Cardiac Unit (ACU), or step-down unit, remains open to assist with ICU's capacity to manage the increased burden presented by COVID-19. Ongoing staff education focused on care of the acute cardiac patient and support from cardiologists and cardiac nurse practitioners has been well received by staff and patients. Staffing levels, recruitment and retention, and staff wellness remain priorities on our unit as we continue to navigate pandemic pressures.

Our quality council remains active and has continued to participate in quality improvement work including heart failure optimization, patient education, and noise reduction. Unit 71 is participating in the Cardiac Sciences (Device Clinic) FMC/RGH Pilot, which continues to work toward facilitating virtual electrophysiology consults and completion of consent forms using virtual conferencing technology.

Patient and Family Centred Care (PFCC) initiatives such as Leader Rounding and enhanced communication with patients and families have remained a focus on the unit. Unit 71 continues to champion initiatives such as End PJ Paralysis and frequent mobilization for all patients. As pandemic pressures ease, we look forward to further engagement in quality improvement work.

*RGH Coronary Care Unit (CCU)*

The RGH CCU remains an important location for care for the Calgary Zone's cardiology inpatient population. The Critical Care COVID-19 response has continued to impact this year's admission numbers due to the need to downsize CCU capacity to support ICU surge plans. These changes have been accommodated in collaboration with the site's temporary ACU unit and have been supported effectively by the site's cardiac nurse practitioner-led model of care. This advanced nursing practice role provides consistency in cardiac patient care planning and optimizes evidence-based medical and nursing care for CCU patients and families. Cardiac care is also supported with an integrated nursing and allied health care team.

The RGH CCU remains dedicated to the advancement of cardiac focused nursing education. RGH CCU and U71 Nurses, Clinical Nurse Educators, Nurse Practitioners, and RGH Cardiologists continue to support continuing education through the organization and provision of specific site and zonal Cardiology Education Days. These education days highlight the inter-professional collaboration that fosters ongoing excellence in cardiac care and advancement of clinical best practices.

The RGH CCU is involved in design work for the CCU redevelopment to be located in the south addition building

at the Rockyview General Hospital. This new space will allow for future growth in CCU capacity and state-of-the-art patient and family care environments.

*RGH Cardiac Function Clinic*

There has been a steady increase in the number of patients There continues to be a steady increase in the number of patients into the RGH Cardiac Function Clinic with a current patient census of 349 patients. In addition to in-person clinic visits, we continued using remote monitoring methods and phone interactions to support heart failure patients with complex care needs. The clinic participated in educational activities over the past year and worked to incorporate best practice recommendations into care.

*RGH CV Lab*

In the past year, CV Labs has seen a reduction in service volumes due to the pandemic. In Echo, all requisitions are now carefully considered by the consulting physicians to determine the necessity of completing a sonography exam. This includes collaboration with the referring physicians to ensure a quality test would be helpful to patient outcome. The Echo team dedicated time to, and successfully completed and met, Accreditation Canada standards by developing sound policies and processes to ensure quality and safety for all patients.

There was a  steady number of patients in the ECG department compared to previous years. Our cohesive team continues to perform at a high level within ideal response times while being flexible to our partners such as the Emergency Department and Inpatient Units. The team has received a request to help other sites address their workload by completing interpretations and accommodating patients for earlier Holter appointments.

## *South Health Campus (SHC)*

**Executive Director – Paul Stewart**

SHC is home to over 12 Cardiac Clinics and full Cardiac Diagnostic Services.

Cardiac Clinics and Diagnostic have continued to be impacted by the ongoing pandemic. Patient volumes have nearly returned to pre-Covid levels. Referrals have grown for several clinics including: Cardiac Function, Hypertrophic Cardiomyopathy, Cardio Oncology, Cardiac Amyloidosis, and the Complex Aortic Program. Staff turnover has been a challenge, resulting in delayed patient care for some areas. While recovery has been slow, we are looking forward to a new normal for the coming year.

## *TotalCardiology™*

TotalCardiology Rehabilitation has provided secondary prevention of cardiovascular disease services through its rehabilitation program to residents of Alberta Health Services Calgary Zone for more than 25 years. The program also offers screening and primary prevention services for those who either self-refer or are referred by their family physician. The foundation of the program continues to be early access, quality patient education, health coaching, and timely medical intervention. The team strives for the highest quality integrated cardiovascular wellness, clinical care, education, and research.

TotalCardiology continues to have great success with the Early Cardiac Access Clinic (ECAC). STEMI, NSTEMI, and ACS patients continue to be assessed within four to 10 days of hospital discharge. The program's success has contributed to timely program participation and an increased number of separations, defined as those who complete the traditional 12-week program or satisfactorily graduated from an individualized program. In the period of January 1 to December 31, 2021, the team had 2,161 patient separations, which is comparable with the previous year, and 3% above our contracted quota.

To optimize patient safety and align with AHS COVID-19 protocols, TotalCardiology continues to offer a hybrid in-person and home-based exercise and health coaching program. Patients are contacted regularly by our team for support with risk factor management and health behaviour change. tele-Consults are offered by program physicians, and patients are given the option to attend onsite exercise stress appointments or have physicians follow up by telephone.

Patient education materials have been mobilized online, including the creation of four "Guides" and associated video modules with concise information on the team's core health behaviour topics (heart disease, exercise, nutrition, and stress). Additional education is provided during 1:1 calls between patients and their rehab team including exercise orientation and tracking.

Partnerships with hospital and community groups have allowed us to expand services to new populations including the launch of the Heart Failure Continuity Clinic (HFCC) in April 2021. The HFCC intends to prevent gaps in care during the high-risk post-discharge period of decompensated heart failure patients who do not have access to a family physician. TotalCardiology also continues to foster medical education within the clinic and coordinated rotations for those physician residents

specializing in cardiology and physiatry.

Our research committee, the TotalCardiology Research Network (TCRN), has continued to produce high-quality research. Over the past year, the committee published five peer-reviewed papers covering clinically relevant topics within the context of cardiac rehabilitation. It also published three conference abstracts in a variety of journals such as "European Journal of Preventive Cardiology" and the "Canadian Journal of Cardiology," Finally, we successfully hosted the third annual TCRN Research Retreat using a hybrid of in-person and virtual attendance in April 2022. This included presentations from three outstanding graduate students and early career investigators on topics such as ability of estimates of functional capacity to predict mortality, sex-based differences in clinical outcomes in cardiac rehabilitation, and exercise-based predictors of training responsiveness in patients with cardiovascular disease. This retreat attracted international participants and presenters from the United States.

# RESEARCH

The Libin Cardiovascular Institute is working to prevent and reduce the risk of cardiovascular diseases while improving detection, treatment, survival, and quality of life of impacted individuals and populations. Our members have had a productive year in 2021-2022.

A snapshot of the core research metrics is as follows:

- Number of publications by Libin Institute members: 792
- Number of publications with an impact factor greater than 10: 58
- Number of students (undergraduate, graduate, PDF) supervised by a Libin member: 160
- Number of students registered in the Cardiovascular/ Respiratory Science program: 44

## *GRANTS/RESEARCH REVENUE*

The Institute garnered $29.8 million in research revenue in 2021-2022 with $8.5 million in revenue coming from CIHR grants.

# EDUCATION

**Message from the Deputy Head of Education - Dr. Vikas Kuriachan**

Clinical education is a valuable component of the Department of Cardiac sciences. This includes education of medical students, residents, fellows, and faculty development. The clinical training areas include cardiovascular anesthesia, cardiovascular intensive care unit, cardiac surgery, cardiology, and cardiology subspecialties. The faculty are driven to be educators and over the past year some received teaching awards from other programs such as Dr. Jeff Shaw, who won the Ectopic Teaching Award in Internal Medicine and Dr. Jacques Rizkallah, who won the University of Calgary Student Teaching Excellence award from medical students. Some of our faculty have significant roles in education such as Dr. Sarah Weeks, Assistant Dean Pre-Clerkship in Undergraduate Medical Education, and Dr. Lisa Welikovitch, Associate Dean in Postgraduate Medical Education. Dr. Todd Anderson has been named the next Dean of Medicine.

## *UNDERGRADUATE MEDICAL EDUCATION*

**Cardiovascular Course Chair - Dr. Jacques Rizkallah**

Many members of the Section of Cardiology have been actively involved in undergraduate medical education at the University of Calgary for years. This is especially true of the cardiovascular curriculum in Course 3. Course chairs have included Dr. Sarah Weeks, Dr. Andrew Grant, Dr. Michael Slawnych, and most recently Dr. Jacques Rizkallah. Students have provided numerous favourable reviews and awards to educators from the Section of Cardiology over the years. This year, Dr. Jacques Rizkallah received the University of Calgary Student Teaching Excellence Award.

## *POSTGRADUATE MEDICAL EDUCATION*

### *Cardiology Training Program*

**Program Director - Dr. Katherine Kavanagh**

Once again, CARMS interviews were completed virtually in September. The team completed 38 Zoom interviews and successfully filled the program's four ministry funded spots. Dr. Tauben Averbuch (McMaster), Dr, Golnaz Roshankar (U of C), Dr. Andrew Bond (U of C), and Dr. Kaitlin McGrath joined us in July.

COVID-19 continued to play havoc with the program this year. Our junior trainees and cardiology trainees were in isolation at various times and we had to activate our backup call schedule on occasion. COVID also interfered with electives from various Canadian and international programs. As a result, we couldn't work with some potential 2022 CARMS applicants. Interprovincial electives were cancelled until September 2021 for some Canadian programs.

The Cardiology Training Program's educational programs and various rounds continue to be delivered virtually, with rich content and excellent attendance. Many longitudinal clinics continue to be held virtually via telephone or Zoom. More in-person clinics are being held recently. However, many patients are still reluctant to come to in-person clinics. We arranged for an AHS virtual room platform to facilitate Zoom clinics.

Because many of our educational activities were virtual, bedside teaching has been a concern. We attempted to address this with a few non-virtual clinics and with one-on-one bedside teaching sessions and didactic academic half-day sessions on clinical exam. Recently, we have been permitted to resume in-person teaching sessions.

We continue to support our two online educational programs (ACC CardioSource Plus and Knowledge to Practice (K2P) from the Mayo Clinic) to supplement the educational component of our program as our trainees were unable to travel to cardiology meetings or the Mayo review course again this year. Four trainees successfully completed the Royal College exam in the fall of 2021. These trainees include Drs. Sudhir Nishtala and Adrian Chikwanha, who are pursuing echo fellowships at the University of Alberta; Dr. Elizabeth Chan, who is pursuing an echo fellowship at the University of Ottawa; and Dr. Nathan Leader, who is pursuing an echo fellowship at the University of Calgary. Drs. Nishtala and Leader obtained the Arthur Child Scholarship to facilitate their fellowship training.

Our four senior cardiology trainees will take the Royal College Exam this year. Dr. Nabila Mahdi has been accepted for an interventional fellowship at the University of Calgary. Dr. Ahmed Moustafa has been accepted for an electrophysiology fellowship at Western. Dr. Alexei Savtchenko has been accepted for an echo fellowship in Toronto. Dr. Angie Woodman has been accepted for an interventional fellowship at the University of Calgary.

We officially initiated the Royal College CBD program in July 2021. It has has been going well and our Competency Committee and faculty advisors are familiar with the nuances of CBD and the Royal College portfolio. Our faculty have for the most part adjusted to the required EPAs.

We had a successful annual retreat in June. It was very helpful in updating our goals and objectives in preparation for the Royal College External review, which will occur in September 2022. We are happy to have our program administrator, Ms. Julie O'Keeffe, back from maternity leave to help us with the preparation of the documents for the external review. From January through March we were focused on preparing documents required for the Royal College External Review, which will take place in September 2022.

### RESIDENT PUBLICATIONS

- Eight peer-reviewed publications or presentations in 2021-2022

## *Cardiac Surgery Training Program*

**Program Director - Dr. Daniel Holloway**
**CBD Lead - Dr. Muhammad Ahsan**

The cardiac surgery program continues to be highly productive and successful. Eight residents are enrolled in the program, which is supported by 12 dedicated adult cardiac surgeons, making it one of the largest cardiac surgery training programs in Canada. The surgical program remains highly desirable for cardiac surgery training. All members of the section are committed to residency education and work to provide a superior training environment. The program's academic curriculum consists of academic half days focused on didactic teaching, wet-labs, simulation, journal clubs, thoracic aortic rounds, M and M rounds, and cardiovascular triage rounds.

The academic schedule is well-partnered with the Department of Surgery curriculum, including critical thinking, surgical skills, Surgical Foundations, and CanMEDs. The program's junior residents also attend a teacher training retreat, which prepares them to become educators and leaders. There is an increased amount of simulation and hands-on skills offered by the program, including labs for cadaveric dissection and minimally invasive valve surgery. In the operating room, residents are trained in complex open-heart procedures, minimally invasive valve surgery, pacemakers, mechanical circulatory support, endovascular aortic surgery, complex aortic procedures, and transcatheter valve implantation. Opportunities in clinical outcomes, basic science, and translational research are also supported. Residents continue to be highly productive in research and have successfully presented their work at many national and international meetings.

The program welcomed its newest resident, Dr. Daniyil Svystonyuk, last July. We had another successful CARMS match in 2022, and we welcomed Toshiro Sembo to our program in July.

The COVID-19 pandemic has been a challenge for education and training in many aspects. However, all members involved have exhibited excellent resilience. The John Burgess Research Day was unfortunately postponed again, but it will resume as soon as possible. Wet-labs and simulation days are proceeding and getting back to previous levels. Overall, the program is in good shape and will continue to train excellent cardiac surgeons for the future.

### AWARDS

- First Place - 2022 Bigelow Cardiac Surgery Resident Research Competition – Vishnu Vasanthan
- First Place - 2021 Canadian Cardiovascular Society Trainee Research Competition – Vishnu Vasanthan

### RESIDENT PUBLICATIONS

- 44 peer-reviewed publications or presentations in 2021.

## *Electrophysiology*

**Program Director - Dr. Yorgo Veenhuyzen**

The Adult Cardiac Electrophysiology Fellowship Program is one of a few programs in Canada recognized by the Royal College of Physicians and Surgeons of Canada as an accredited Area of Focused Competency (AFC) Training Program. Though the EP Fellowship Training program at the Libin Cardiovascular Institute is over 30 years old, this recognition by the Royal College is relatively new. The program received a favorable Royal College Internal Review.

Dr. William Lee received his Royal College Diploma and returned to Australia where he took a position at St. Vincent's Hospital in Sydney. An appointment with the University of New South Wales is imminent.

This year, Dr. Bert Vandenberk has completed his AFC Portfolio ahead of schedule and will be returning to an academic position at the University of Leuven in Belgium. While here, he also completed a certificate course on Artificial Intelligence in Healthcare offered online by the M.I.T. Sloan School of Management, as well as the Global Clinical Scholar Research Training Course offered online by Harvard Medical School.

Dr. Sevan Letourneau will complete two years of training in clinical electrophysiology and pacing and will be returning to work in Israel with her husband and family.

Dr. Kyle Murray will be completing his first of two years of training, and Dr. Tarek Hatoum is completing a fellowship in syncope and autonomic disorders under the supervision of Dr. Satish Raj.

We look forward to the arrival of Dr. Rory Dowd from the UK and Dr. Liane Arcinas from the University of Manitoba who both begin two years of training in Adult Electrophysiology. The Training Program is well-positioned for the upcoming External Accreditation by the Royal College in September.

## *Interventional Cardiology*

**Program Director - Dr. Francois Charbonneau**

For the last 40 years, the Foothills Interventional Cardiology Service (FICS) has trained more than 80 cardiology graduates. These fellows have become experts and leaders in catheter-based, diagnostic and therapeutic invasive procedures across Canada, Europe, the US, Australia, and the Middle East.

In 2021 – 2022, the Interventional Cardiology program included three fellows. Dr. Meshal Alhajeri completed his training in June 2022 and returned to his home country, Kuwait, to establish his practice.

Dr. Sarah Woolridge will complete her interventional training in October 2022, after a short but productive interruption to welcome her wonderful daughter, Florence! Finally, Dr. Nishant Sharma will continue training in 2022-2023, assuming the position of senior fellow and assisting the three new fellows who started in July 2022.

## *Echocardiography*

**Program Director - Dr. Jillian Colbert**

The Adult Echocardiography Fellowship Program at the Libin Cardiovascular Institute is a 12-month program with a strong clinical focus. It has capacity for one fellow per year. Over the last year, Dr. Omid Kiamanesh graduated from the program and is now a staff cardiologist with the Libin Cardiovascular Institute. During his echo training, Dr. Kiamanesh served as the trainee representative on the Canadian Society of Echocardiography board and contributed to the annual CSE conference. He was also active in research

in VA Coupling in PE, VA Coupling in mixed aortic valve disease, and the ARTICA POCUS study. In July of 2021, we welcomed Dr. Nathan Leader as our echo fellow. Dr. Leader has contributed to clinical care and teaching of junior residents and has a long-term plan to stay and work in Calgary as a clinical cardiologist and echocardiographer. Both Dr. Kiamanesh and Dr. Leader were funded by the Arthur E. Child Fellowship for cardiology trainees.

### *Heart Failure*

**Program Director - Dr. Kristin Lyons**

The Advanced Heart Failure Fellowship Program has Dr. Brennan Ballentyne as a trainee for the 2021-2022 academic year. Dr. Ballentyne is undertaking a combined advanced heart failure/electrophysiology (EP) fellowship at the Libin. His heart failure training was complete in June of 2022, and he is now working on the second year of his electrophysiology training. His combined fellowship will uniquely position him to care for complex heart failure patients with device and/or arrhythmia related complications.

### *Cardiac Sciences Grand Rounds*

Cardiac Sciences Grand Rounds runs from September until June. The COVID-19 pandemic significantly changed the dynamics of rounds, which have exclusively moved to a virtual format. Attendance markedly increased with more than 70 attendees weekly, including physician staff, trainees, researchers and nursing staff. Attendance included local staff, but also staff from the sections of cardiology at the University of Alberta and University of British Columbia. The program continues to attract world-class national and international speakers, facilitated by the virtual format. Despite the clear limitations imposed by the pandemic, the strong support of the pharmacological industry and the Libin Cardiovascular Institute has been instrumental in maintaining the high quality of Cardiac Sciences Grand Rounds. Please see the **Appendix B** for a complete list of speakers.

## WORKFORCE PLANNING

See Table 1 below for a list of retirements and recruitments

### *CARDIOLOGY*

#### SUMMARY OF RECRUITMENT CARDIOLOGY

Three targeted new recruits are joining the DOC in the Summer of 2022: Dr. Nathan Leader trained in echocardiography and general cardiology; Dr. Sudhir Nishtala, general cardiology, echocardiography and cardio-oncology and Dr. Cvet Trpkov with training in general cardiology, echocardiography and critical care.

#### FUTURE NEEDS

- Adult Congenital Heart Disease July 2023 Dr. Patzer
- Women's Cardiovascular Disease Chair 2023
- Geriatric Cardiology July 2023
- General Cardiology seven to eight postings Ongoing
- Academic Advanced Heart Failure
- Academic GFT Section of Cardiology and AHS Zone Head Fall 2022

The DOC continues to grow and as some of our senior members retire or reduce their activities in the next three to five years, future recruitments are necessary. Several areas that are of great interest for the development of the DOC include advanced heart failure, cardio-oncology, geriatric cardiology, and adult congenital heart disease. The DOC is expanding in these areas. Further

*Table 1: Retirements and Recruitments*

| 2021–2022 Retirements | 2021–2022 Recruitment | 2022–2023 Recruitment |
|---|---|---|
| • Anne Gillis<br>• Andrew Maitland | • Derek Chew – EP Health Economist<br>• Omid Kiamanesh – Advanced Heart Failure | • Cvetan Trpkov – CICU<br>• Nathan Leader – Echocardiology<br>• Sudhir Nishtala – Echocardiography<br>• Michael Chiu – CICU/ CVICU<br>• Holly Smith – Cardiac Surgery<br>• Women’s Health Cardiologist<br>• Interventional Chair |

general cardiology recruits are needed to implement and improve cardiac outpatient care across the city. As the management of critical cardiac patients evolves in the next year, two to three cross-trained cardiologists/ critical care physicians will be recruited, and transition of leadership within our cardiac critical care group will be ensured. Academic recruits focused on Women's Cardiovascular Disease with a Chair, advanced heart failure and transplant, clinical trials and electrophysiology are planned within the next two to three years.

### GOALS AND STRATEGIES

The goal of the DOC is to provide the best personalized and timely cardiac care to Calgary and Southeastern Alberta. To achieve this, active recruitment is in place and strategies towards standardizing care across the city are being implemented. An overhaul on the cardiology service delivery model across the city has been initiated and implementation is expected within the next 24 months. Central referral and triaging to improve our waitlists and ability to provide expedited care across the city are being developed. Overnight and weekend coverage has been a pain point within the DOC. An evening nurse practitioner (NP) program has been implemented at Rocky View General Hospital and serves as the model for city-wide implementation. Peter Lougheed Centre has also initiated an NP program successfully, and the goal is to continue to develop, implement and expand these NP programs across all sites. This program will ensure appropriate coverage across the city and increase patient safety and physician wellness.

### IMPACT ON OTHER DEPARTMENTS AND REGIONAL RESOURCES

In principle, no major impact on other departments and regional resources are expected.

# QUALITY ASSURANCE, QUALITY IMPROVEMENT & INNOVATION

## *GENERAL*

### *Cardiac Sciences QA committee*

This committee is co-chaired by Amanda Weiss and Dr. Imtiaz Ali. Two QAR reviews have been finalized and the recommendations instituted. There are two reviews underway, both in Cardiac Surgery. The highly functional QAC committee is made up of a wide representation from the Department and meets quarterly. The committee is directly linked to the Zone QA Council, of which Dr. Bill Kidd is also a member.

### Quality Improvement (QI) and Safety Initiatives

COVID-19 put significant stress on our health care system; therefore, much of the 2022 QI efforts were related to pandemic planning and response. Teams were quick to collaborate across all sites to ensure the safety of patients, families, staff, and physicians.

Across the zone, Department of Cardiac Sciences physicians, inpatient units, outpatient clinics, CCUs/CICU, and the CVICU promptly adapted their processes and worked closely with Infection Prevention and Control (IPC), Patient Safety, Critical Care teams, Cardiac Sciences Clinical Informatics, and others to adopt virtual care in daily practice, to prevent and respond to outbreaks, and to absorb the increased COVID-19 demand. Examples of initiatives include personal protective equipment (PPE) and Designated Support Person (DSP) coach programs, which are taking place at South Health Campus (SHC); the COVID-19 ICU Surge Plan, a collaboration between the Foothills ICU, CVICU and CICU; the Calgary Zone - CCUs Patient Flow initiated to support ICU expansion to CCUs spaces; and the development of the Cardiac Sciences Patient dashboard in Tableau.

In addition to COVID-19 pandemic and Connect Care implementation efforts, the Cardiac Sciences team continued to move forward innovation and quality improvement initiatives:

The Advanced Heart Failure program successfully launched the Invasive Heart Failure Monitoring Program with Wireless Pulmonary Artery Pressure monitoring technology (second in Canada) and celebrated the patient success of five-year LVAD therapy Heart Failure Pathway for PCNs.

The arrhythmia group was the first in Canada to perform a left bundle branch pacemaker lead implant. Our center was also the first in Western Canada to perform a fluoroscopy-free complex atrial fibrillation ablation. (**See story in Appendix C**).

In FMC, Units 81 and 82, the team worked on the Patient Workload Acuity Scorecards to help the nursing team manage assignments between care hubs; implemented the Anticipated Date of Discharge (ADOD) order set in SCM to foster early discharges; and incorporated the new

heart Failure Guidelines to teaching videos for patients. CICU added the Respectful Behaviors in the Workplace training to its annual recertification to continue promoting a culture of respect and safety.

The Cath Lab began implementing the Safe Surgical Checklist tailored to Cath lab procedures and the 5S & Kanban processes in the Cath Lab storage room to improve inventory management.

The cardiovascular (CV) surgery team started a few projects to streamline processes around referrals to CV surgery, patient transfers between FMC CVICU/Unit 91, and postoperative care of patients undergoing minimally invasive cardiac surgery.

The cardiac anesthesia group is at the forefront of the design and implementation of an Enhanced Recovery After Cardiac Surgery (ERAS) program. ERAS implementation involves a multidisciplinary team of health-care professionals including anesthesiologists, surgeons, intensivists, and nurses.

The Cardiac Science QAC completed one Quality Assurance Review looking at accessibility of urgent blood. The review identified that immediate access to blood can be improved by increasing the number of units of standby blood (red cell) per cardiac surgical patient and by using a haemonetic blood fridge. As a result, the standby order for pre-operative blood was revised to be a minimum of two units of red cells for Cardiac Surgery patients, and the CVICU awaits installation of a haemonetic blood fridge.

# CHALLENGES, OPPORTUNITIES, FUTURE DIRECTIONS & INITIATIVES

## *CHALLENGES*

- Increased demand for service in a time of unprecedented fiscal restraint
- Increased procedural wait times
- Insufficient infrastructure to meet specific type and volume of patient concerns
- Physician burnout and resulting inability to provide appropriate coverage across the zone
- Physician retention in acute care hospital service
- Funding for innovation and education

The Department has seen unprecedented growth in open-heart surgery, electrophysiology ablation procedures, and the need for diagnostic testing and outpatient consultations. This increased demand comes at a time of increased fiscal restraint. Accordingly, the Department is challenged to deliver timely access to cardiovascular services while “holding the line” on costs. To address such growth, the Department made efforts to enhance efficiency, increase the appropriateness of procedures, and improve access to care through central triage models. We believe that a central referral system both for open-heart surgery and all life-saving cardiovascular interventions, for example, may increase accessibility to care for patients and improve appropriateness of procedures.

The waitlist for open-heart cardiac surgery continues to be a priority area. Surgical results have been outstanding, and quality has remained excellent despite an increased acuity of the nature of the patients and increased co-morbidities such as age, diabetes, and other chronic diseases that can negatively influence outcomes. The waitlist has decreased over the past year, despite service reductions from COVID-19, but demand for services remains high. A working group led by our QI lead has determined underlying mechanisms responsible for growth and wait times for this program, and improvements in data definitions, collection, and use of ACATs codes has proved useful.

The increasing growth and restrained resources in an environment of fiscal restraint throughout the Department are contributing to a decrease in physician wellness and physician burnout. Such growth strains physician workloads, and we have experienced a resultant decrease in staff wellness. Consequently, the Department remains challenged to provide and effectively coordinate the human health resources necessary to safely cover the needs of the Zone. For example, the Department has seen increasing strain related to city-wide cardiology night coverage across the Zone to provide 24/7 care at all four acute care hospitals. These include emergency admissions and critical care beds, which must be serviced with cardiology expertise.

Given changing pressures in educational programs and the lack of adequate physician extenders, we remained challenged with the threat of physician burnout for our cardiologists who cover all sites. We view this as an opportunity to explore new ways to deliver care and alter service models. Recruitment of nurse practitioners at each location may alleviate some burden as the Department’s nurse practitioners have traditionally performed outstandingly well. The Department has an opportunity to explore this model further at all acute care sites with possible centralization of some of these services.

The Department will continue to dedicate resources and attention toward a culture of wellness for physicians.

## *OPPORTUNITIES AND FUTURE DIRECTIONS*

We will pursue five key opportunities and strategies to enhance patient care in the Department of Cardiac Sciences:

**1. Embracing an effective multi-disciplinary "heart team" approach to clinical care by promoting a multi-disciplinary, collaborative approach to cardiovascular disease treatment.**

Further oversight and collaborative effort for cardiovascular patients may allow us to improve efficiency and access while still delivering outstanding quality. This will require coordination between AHS clinical operational leaders and all members of our Department. Section chiefs will need to provide strong leadership and influence cultural and behavioural changes in referral patterns and practices. Focused leadership and service line philosophy of the Department of Cardiac Sciences will put it in an excellent position to be leaders in a collaborative approach to cardiovascular care. The Department believes appropriateness has improved due to the various inputs of cardiology, cardiac surgery, cardiac anesthesia, and cardiac critical care. The impact of this approach highlights an enormous opportunity to implement routine multidisciplinary heart rounds across the Department to enhance appropriateness and increase access to care. Enhancing connections with the Person to Population (P2) program at the Libin Cardiovascular Institute can also help reduce demand on the system by increasing health promotion and chronic disease prevention activities in the community and primary care setting.

2. **Fostering the growth of the structural heart program (catheter-based cardiovascular interventions) and supporting academic successes within interventional cardiology**

The adjusted 30-day STEMI and PCI mortality was significantly lower at our centre compared to the national adjusted averages, making Calgary the top in care nationwide. There may also be opportunities to expand into structural heart interventions, and our multidisciplinary TAVI program continues to grow with exceptional results. Such patients can now receive an aortic valve intervention without general anesthesia, which results in rapid discharge (within one to two days post op). Structural heart interventions are an opportunity for enhanced value and patient satisfaction. The Department believes that as we expand into structural heart interventions, it can decant some resource intensive open-heart surgeries and improve capacity and access to life-saving procedures. To that end, we will continue to focus on recruitments.

3. E**nhancing efforts to reducing recovery time and promote early discharge to manage surgical demand, mitigate costs and enhance the overall patient experience**

Innovations to reduce the surgical waitlist remain somewhat challenging due to financial constraints and efforts to focus on maintaining the current quality service at the increased volume. The Department is focusing on initiatives that improve efficiency and provide better value for its patients. For example, the enhanced recovery after surgery (ERAS) program led by our cardiac anesthesia group may offer more rapid recovery and early discharge, which could provide more cost savings and improved patient outcomes. Along the same lines, minimally invasive cardiac surgery has grown and is a key priority. The Section of Cardiac Surgery obtained outstanding results, and the Department is collecting data to determine the possible benefits of this approach to accelerated recovery and decreased length of stay. We will assess the patient experience by monitoring patient-centered metrics to confirm whether patients favour such approaches.

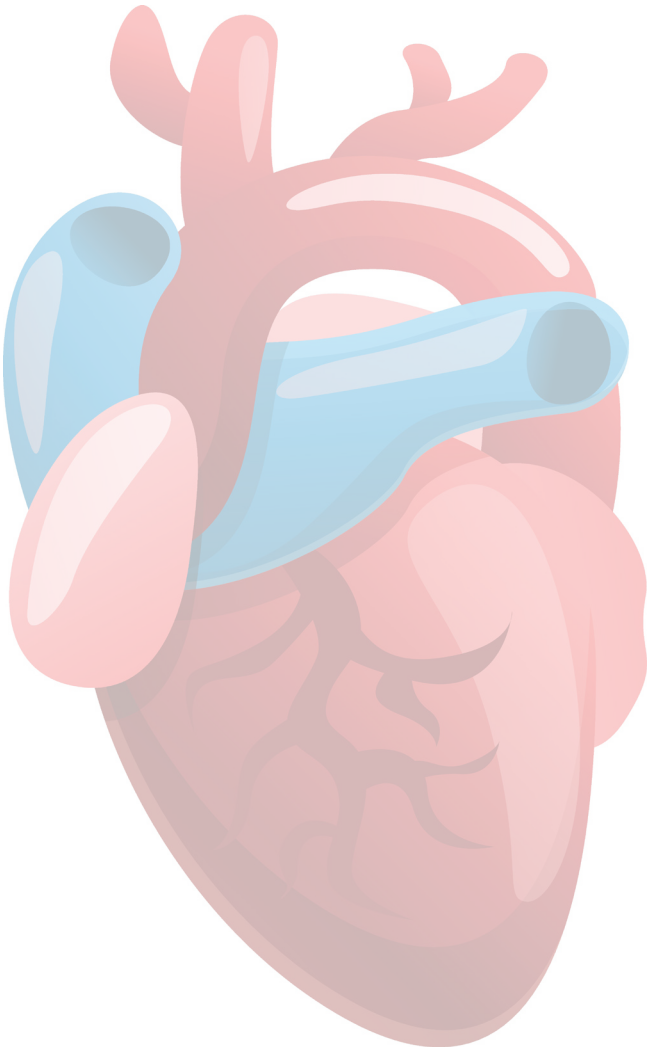
4. **Utilizing the potential of existing AHS data platforms/ infrastructure to enhance real-time decision making and quality improvement**

There is a significant opportunity to utilize existing data platforms to enhance real-time decision making and improve value-based patient-centered care. During the pandemic, the Department had an excellent experience using some AHS informatics platforms such as Tableau to link leadership and provide timely actionable data across the Zone. For example, it used a Tableau-based dashboard to show the status of all beds across all sites. This allowed a centralized approach to ensure adequate coverage and accessibility of care across the Zone. There are also opportunities to link with the provincial SCN networks to learn from other sites and share our learnings across the province. Working through the Libin Cardiovascular Institute, the Department will begin integrating its existing data assets and building physician capacity to use data to support clinical decision making.

5. **Improving integration with the Libin Institute's people, platforms, and programs toward value-based innovations in clinical care (data science and precision medicine)**

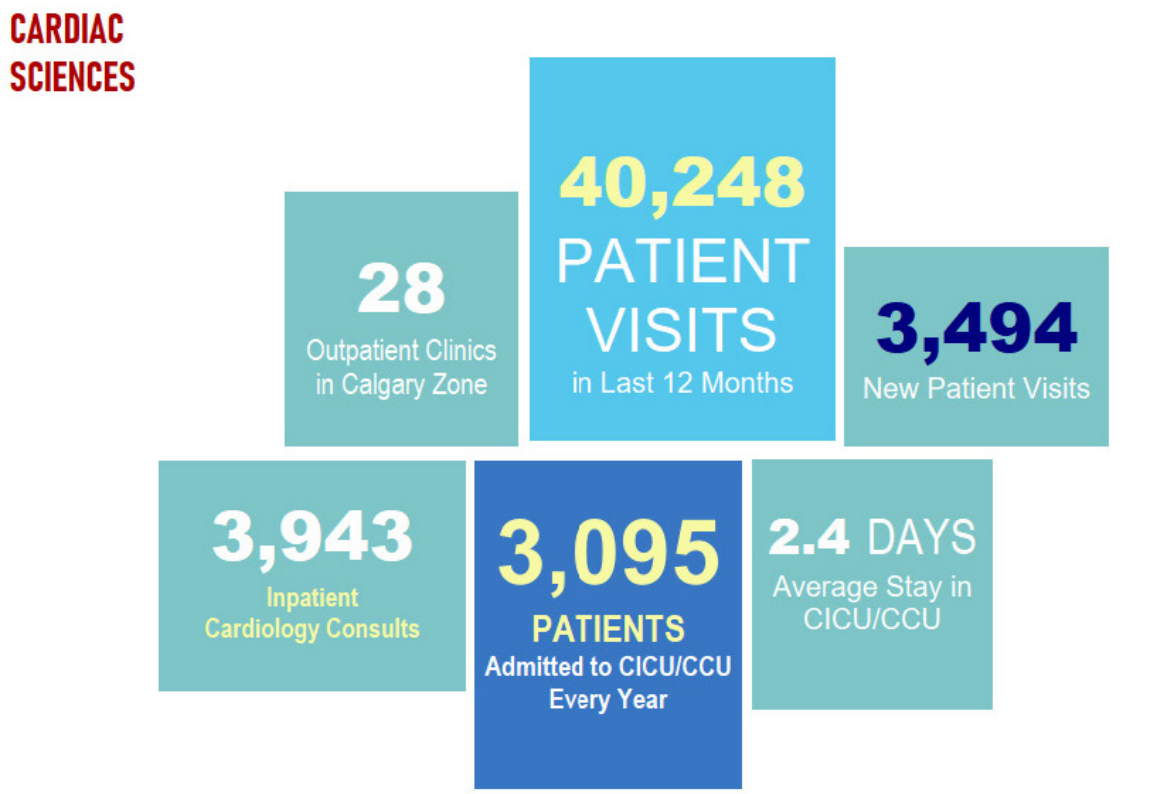
The Department and the Libin Cardiovascular Institute invested in a joint strategic plan to crystallize an integrated vision for the future and develop an end-to-end road map for achieving it. We will better harness the research and health care modifying potential afforded by improved integration between the Department and the Institute. To that end, we will invest in our data resources and transform our data into actionable information to improve patient outcomes and drive value (improved quality with less cost) to ensure our legacy of outstanding cardiovascular care is sustainable. Our unique organizational structure—a fully integrated multi-disciplinary clinical department and cardiovascular research institute—allows for a comprehensive approach to precision medicine.

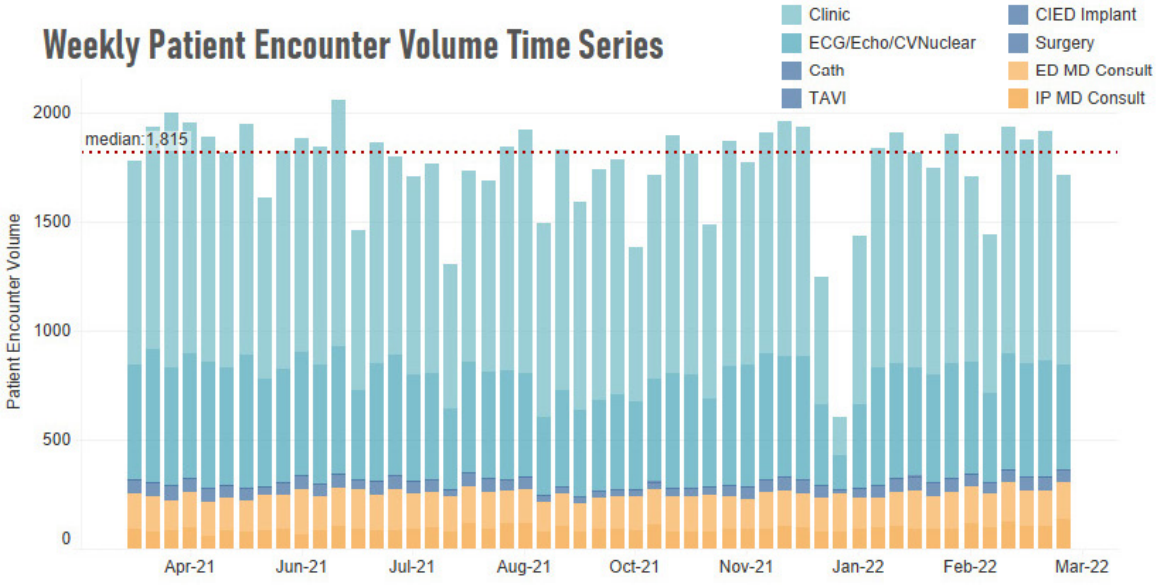
We intend to leverage our unique capabilities to advance patient-centered, valued-based practices that will enhance patient-reported outcomes, increase access to care, and improve quality while reducing cost. In brief, we hope to promote a “better model for better care.” We believe that collaboration between the Institute and the Department of Cardiac Sciences offers immense value to the community, as it allows us to use our robust data enterprise to find and address gaps in care, reduce variability, and develop the tools necessary to make a broader impact. Accordingly, our strategy involves making significant investments in clinical data and further integration of data resources to inform best practices; cultivating a robust approach to sex and gender considerations in both research and clinical care; and reducing demand on the system through innovations in cardiovascular disease prevention and health promotion (P2).



# APPENDIX A

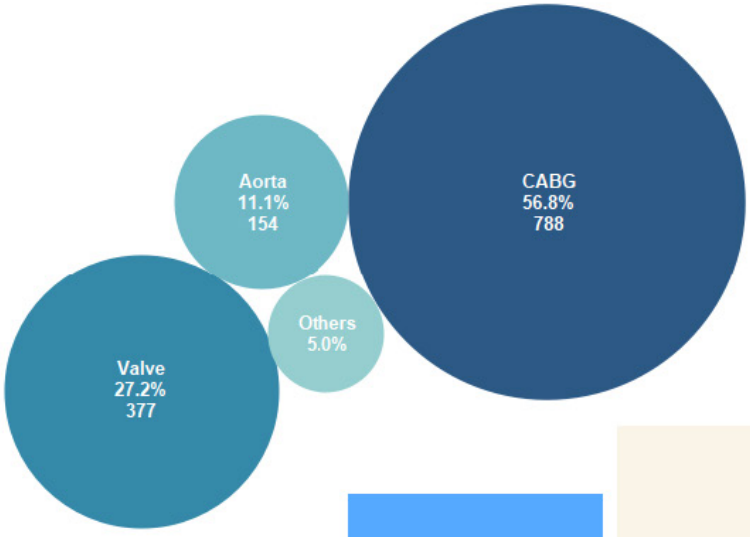
## *Data Graphs*



# CARDIAC SURGERY

CARDIAC SURGERY PRIMARY CATEGORY




**3** TEVAR

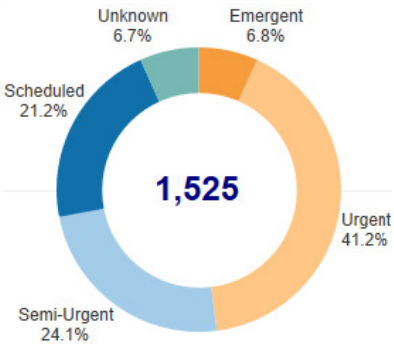
**8** LVAD

**147** Minimally Invasive Procedures

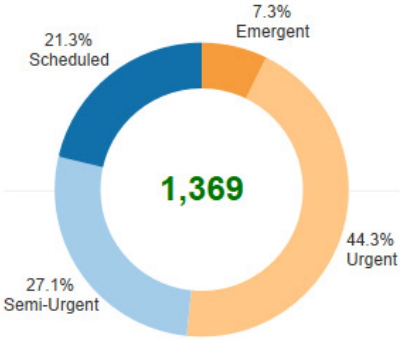
**2,215** NEW SURGERY REFERRALS

**690** Referrals Deferred and Transferred to Medical Management & Surveillance

FY2021 Accepted Referrals




FY2021 Completed Surgeries

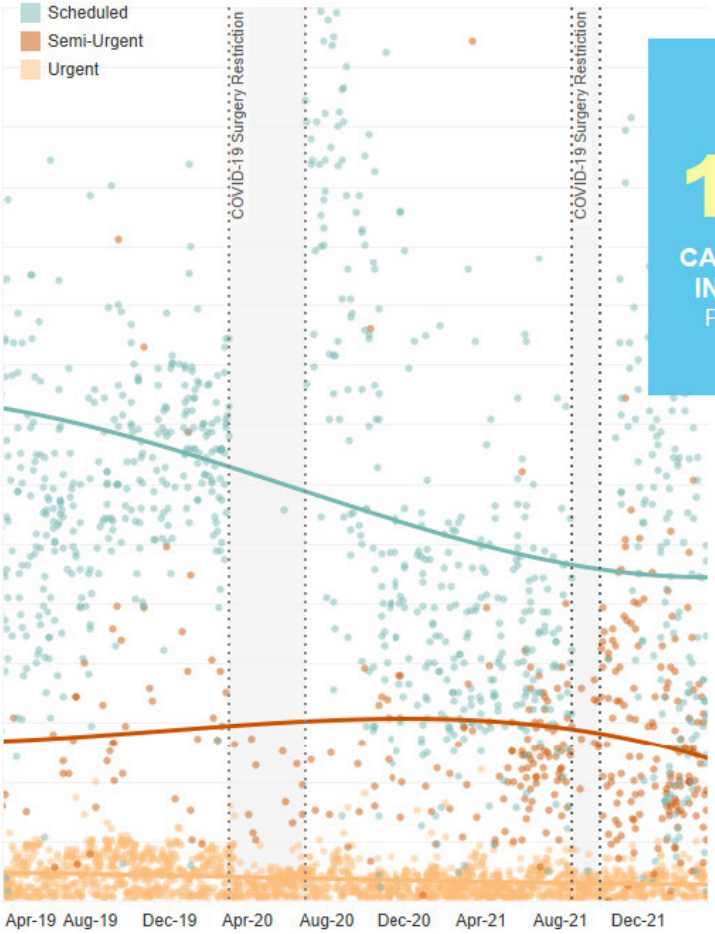



*Excluded: Re-Op Bleeding, PDA, TAVI

# CARDIAC SURGERY

## CARDIAC SURGERIES PERFORMED

**Median Wait Time By Priority Plot**




**1,354**
**CARDIOVASCULAR INTENSIVE CARE**
Patient Admissions

**1.2 DAYS**
Average Stay in Cardiovascular ICU

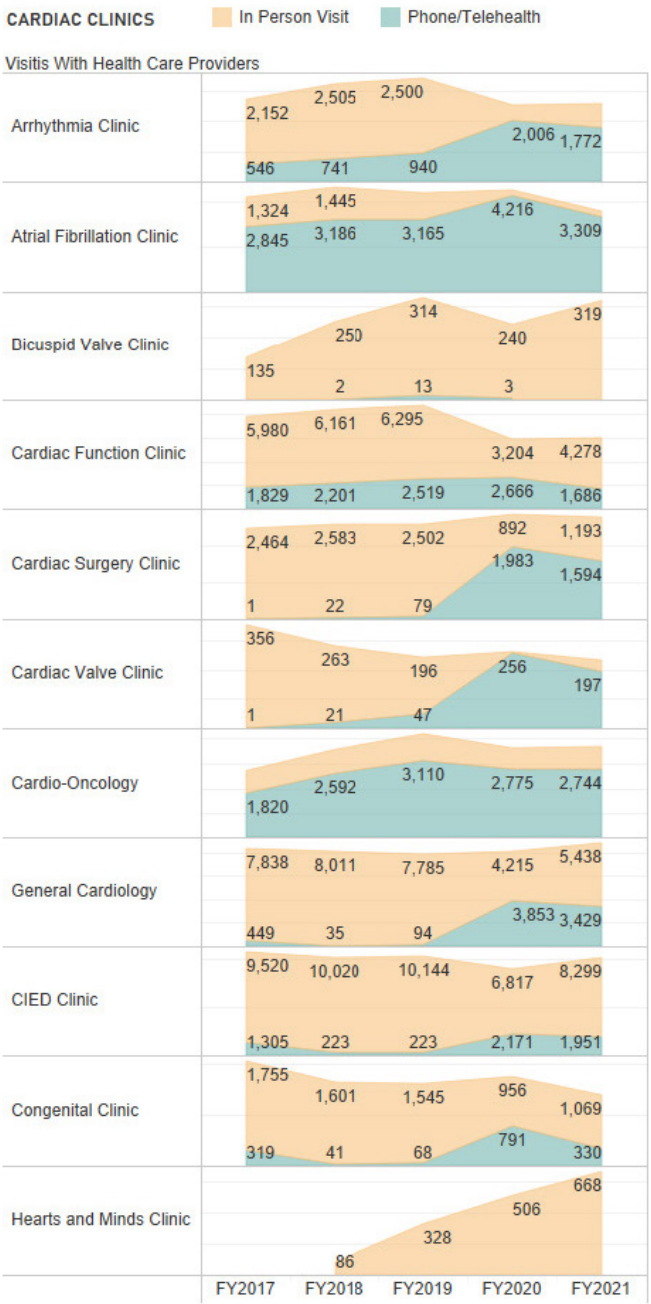
**21**
ECMO INSERTION

**Percentage of Difference of Surgery Wait Time in FY2020 and FY2021**

| | Urgent | Semi-Urgent | Scheduled |
|---|---|---|---|
| FY2021 | -11.2% | 6.4% | -21.8% |

*Excluded: Re-Op Bleeding, TAVI, Procedures done in Cath Lab

# CARDIAC CLINICS




**58%**
**In-Person Visits**

**42%**
Telehealth Visits

* Data Source from Millennium Scheduler

# CARDIAC CLINICS

CARDIAC CLINICS

## No. of New Patients and Follow Up in Outpatient Clinics

### Arrhythmia Clinic

| 624 New Patients | 1,512 Follow Up |
|---|---|

### Atrial Fibrillation Clinic

| 548 New Patients | 948 Follow Up |
|---|---|

### Cardio-Oncology Clinic

| 478 New Patients | 875 Follow Up |
|---|---|

### General Cardiology Clinic

| 1321 New Patients | 5,705 Follow Up |
|---|---|

**Visits With Health Care Providers * Data Source from Millennium Scheduler

# CARDIAC DIAGNOSTIC IMAGING

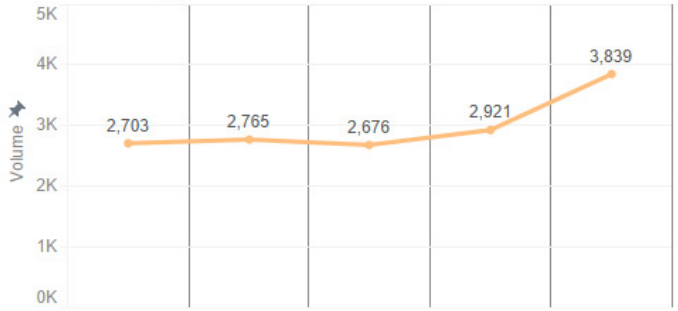
CARDIAC DIAGNOSTIC IMAGING

| ECG | HOLTER | ECHO | STRESS |
|---|---|---|---|
| 203,810 | 11,156 | 19,456 | 1,388 |

## Nuclear Cardiology

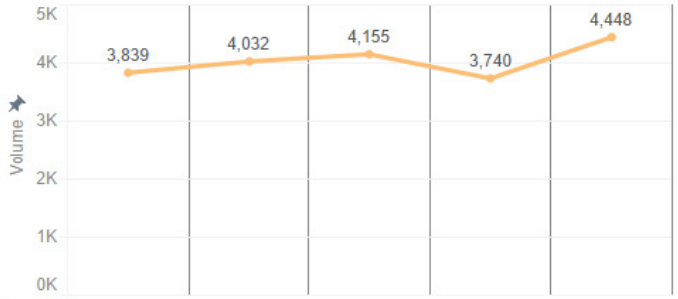
Change From Last Year

31%



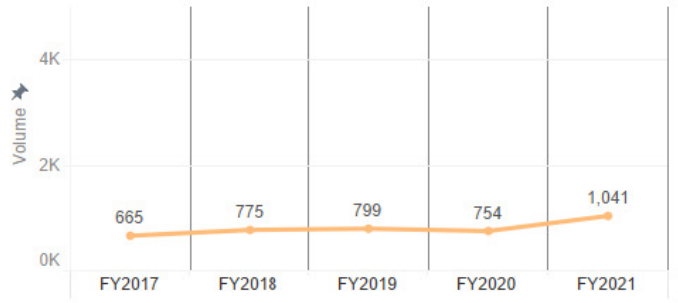

## Cardiac MRI

19%




## Cardiac CT

38%



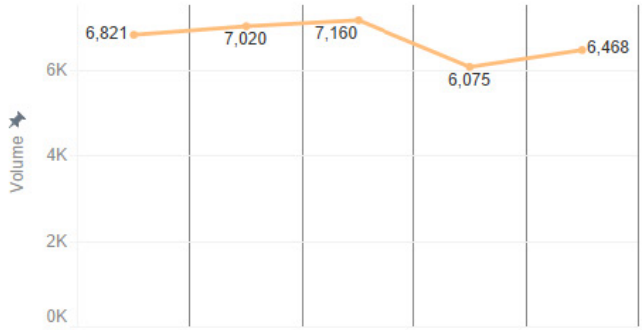

*Excluded DI CT

# CARDIAC SCIENCES

CATHETHERIZATION PROCEDURES

Change From
Last Year

## Catheterization & PCI




6%

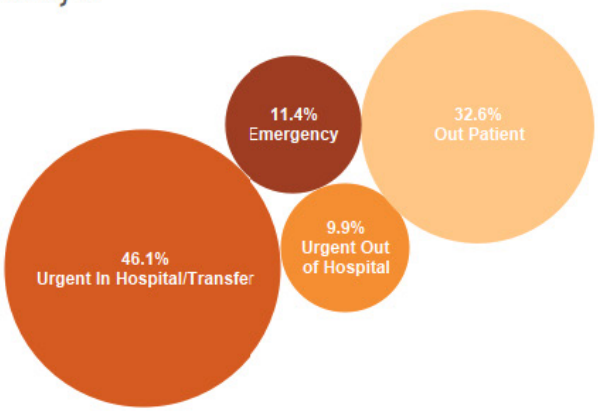
**2,392**
No. of Stents Deployed

## PCI (Angioplasty)


17%

**920**
STEMI Cases

## Urgency Priority %

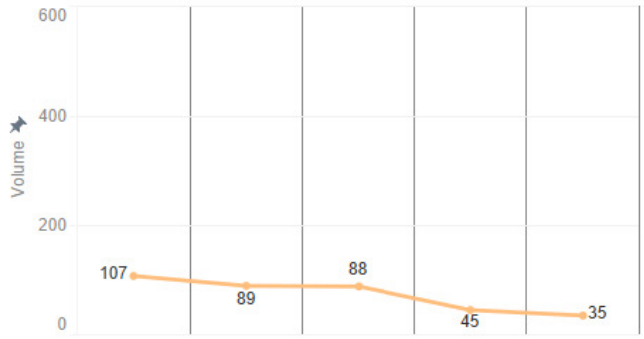


## CARDIAC SCIENCES

ELECTROPHYSIOLOGY PROCEDURES

Change From
Last Year

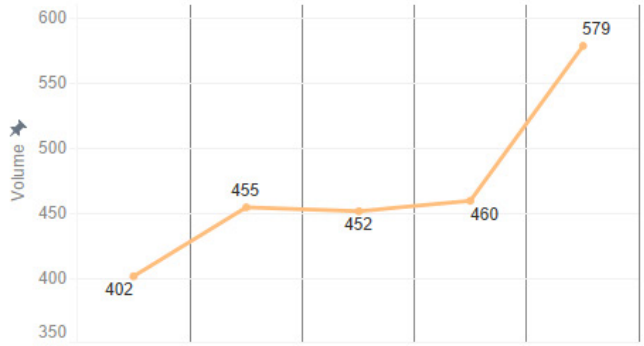
### Standard Ablation (SVT, TAVN)




-22%

**657**
No. of Patients with an EP Procedure

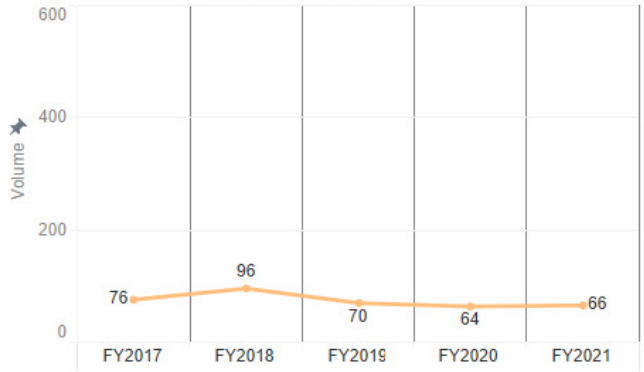
### Complex Ablation




26%

**15%**
Increase in No. of Patients with an EP Procedure over Previous Year

### Ablation Other (EPS/Proc/Epi)




3%

# CARDIAC SCIENCES

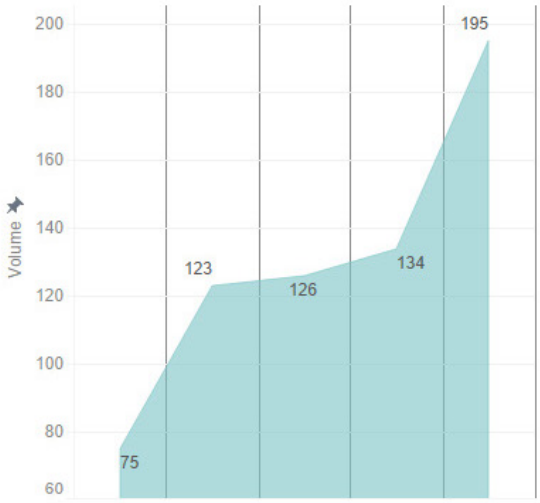
STRUCTURAL HEART PROCEDURES

## PFO


## ASD


## Perivalvular Leak Repair


## TAVI

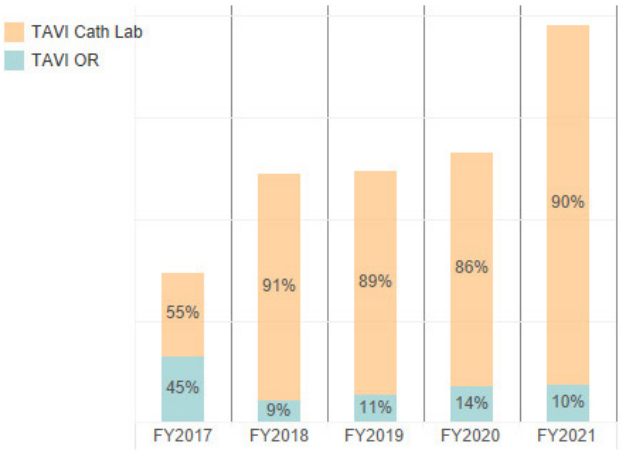



**46%**
No. of TAVI Increased from Last Year

**367**
New Structural Heart Referrals

**74%**
Referrals Accepted

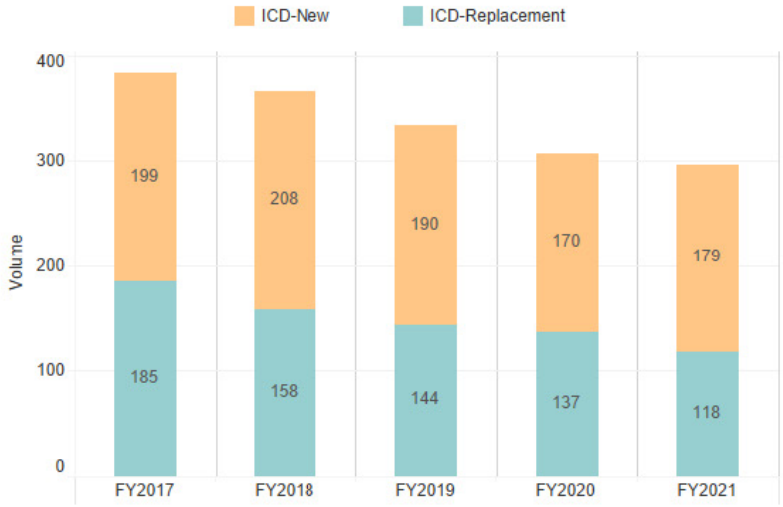
## TAVI Unit Location



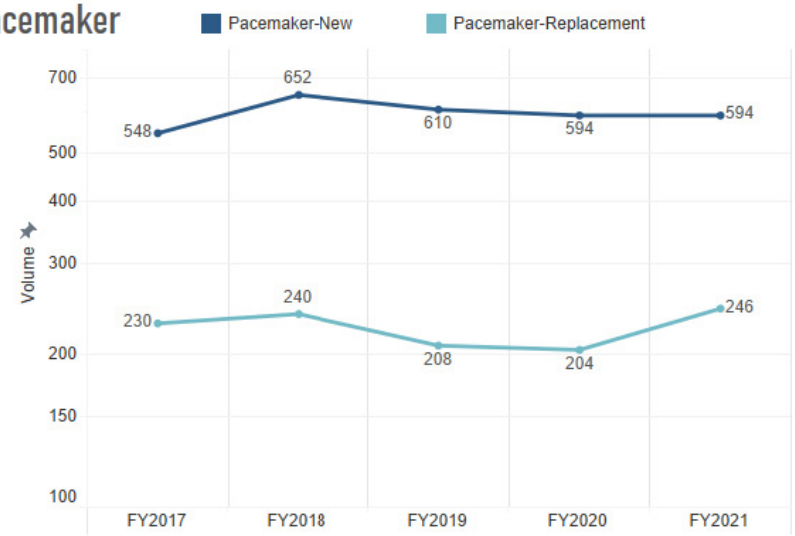
# CARDIAC DEVICES

CARDIAC DEVICES

## Implantable Cardioverter Defibrillator (ICD)




## Pacemaker



**CARDIAC SCIENCES**

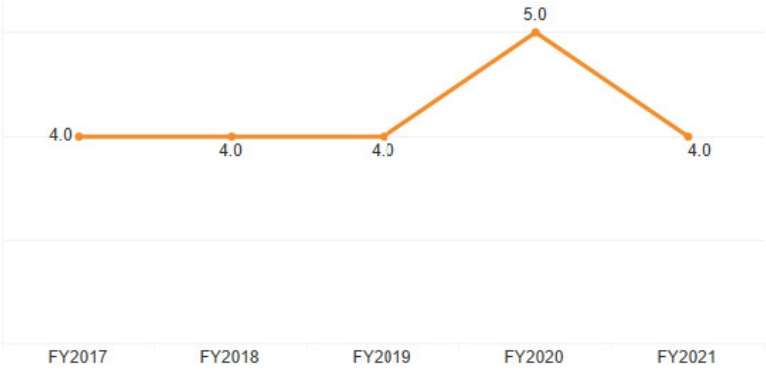
**PATIENT FLOW THROUGH THE EMERGENCY DEPARTMENT**

## No. of Cardiology Consultations in Emergency Department


**7,472**
Emergency Department Cardiology Consults

**68%**
(n=5072)
**ED Admitted to Inpatient**

## Median Length Of Stay of ED Admitted Inpatient (Days)



# CARDIAC SCIENCES HEALTH CARE PROVIDERS

## Health Care Providers

67
Cardiologists

11
Cardiac Surgeons

9
Cardiac Anesthesiologists

10
Cardiac Intensivists

750+
Nurses

185+
Technicians
*Including Perfusionists, Cardiac Surgical Assists and all procedural technicians in Cardiac Sciences

# APPENDIX B

## *Grand Round Speakers*

| DATE | | SPEAKER | TITLE |
|---|---|---|---|
| **APRIL** | 6 | **SURYANARAYAN, Deepa** | Alignment of Incentives with Health Outcomes: The Future of Physician Payment |
| | 13 | **McDONALD, Michael** | Evidence on PCSK9 Inhibitors in High-Risk Patients |
| | 20 | **MITCHELL, Brent** | Can we Eliminate Coronary Disease in our Lifetime? |
| | 27 | **SCHNELL, Gregory** | One and Done? Evaluating Patterns of LV Assessment in Patients with Acute Coronary Syndromes: ACS Choosing Wisely |
| **MAY** | 4 | **BONOW, Robert** | The Goldilocks Conundrum: Finding the Mechanical Support Device that's "Just Right" |
| | 11 | **MORENO, Pedro** | The Use of Big Data in Guiding Clinical Cardiology Practice |
| | 18 | **KIAMANESH, Omid** | Faculty Development on Evaluation, Getting the Most Out of the Process |
| | 25 | **TELFORD, Ryan** | Help! I'm Going to Faint! |
| **JUNE** | 1 | **CODERRE, Sylvain** | Interventional Cardiology at 43 years: LM, CTO and Bifurcations. What are the Limits? |
| | 8 | **LEIPSIC, Jonathon** | Update in Neurovascular Disease in the COVID-19 Era |
| | 15 | **SPOSATO, Luciano** | Anticoagulation for Atrial Fibrillation: 2020 and Beyond |
| | 22 | **SHIBAO, Cyndya** | Gender Equity in the Department of Medicine |
| | 29 | **WHITLOCK, Richard** | NOACs in Chronic Kidney Disease |
| **SEPT** | 7 | **CAMM, John** | Atrial Fibrillation Occurring Transiently with Stress |
| | 14 | **EPSTEIN, Stephen** | The Use of Big Data in Guiding Clinical Cardiology Practice |
| | 21 | **MORILLO, Carlos** | Privilege and Critical Allyship: Tools for Unlocking Meaningful Action on Equity, Diversity and Inclusion |
| | 28 | **HOWLETT, Jonathan** | Applying Health Economics to Optimize Cardiovascular Care |
| **OCT** | 5 | **DENISET, Justin** | Familial Hypercholesterolemia: More Common, and More Complex, than we Thought |

| | | | |
|---|---|---|---|
| | 12 | **PATEL, Vaibhav** | Sudden Death at Crossroads Between Genetics and Clinical Management: The Case of the Long QT Syndrome |
| | 19 | **RAJ, Satish &** | A Trialist's Perspective on Recent and Future Heart Failure Studies |
| | | **SHEIKH, Nasia** | Initial Orthostatic Hypotension |
| **NOV** | 9 | **TARDIF, Jean Claude** | Postural Tachycardia Syndrome: Novel Insights and Treatments |
| | 23 | **GILLIS, Anne** | Cardiac Amyloidosis Update: 2020 and Beyond! |
| | 30 | **BHATT, Deepak** | Asking the Questions – Pregnancy History and Future Cardiovascular Health |
| **DEC** | 7 | **BROWNE, Stacey** | Cardiology in Review 2020 |
| **JAN** | 25 | **KENT, William** | Optimal Management of the Patient with Diabetes and Coronary Artery Disease |
| | 1 | **KURICHAN, Vikas &** | Brugada Syndrome: 30 years of Progress |
| | | **WILTON, Stephen** | 2022 Update on Left Atrial Appendage Occlusion: Patient Selection, Controversies, and Combined Procedures |
| | 8 | **NORRIS, Colleen** | Orthostatic Hypotension – Bad Company for your Brain, Heart and Bone |
| **FEB** | 15 | **TRPKOV, Cvetan** | Special Session on Women’s CV Health |
| | 22 | **SCHERRER-CROSBIE, Marielle** | Update on the 2020 CCS AF Guidelines Part 1 of 2 |
| | 1 | **CHIU, Michael** | The Impact of Socioeconomic Status on the Incidence and Outcomes of CVD: Wealth is Health? |
| | 8 | **NISHTALA, Sudhir** | The Future of Structural Heart Interventions: TMR and Beyond |
| **MAR** | 15 | **LEADER, Nathan** | Lipids in 2021: Looking Beyond LDL |
| | 22 | **O’NEILL, Deirdre** | Women & Heart Disease: Is There Really a Sex Difference? |
| | 29 | **CHEUNG, Christopher** | ACS Clinical Trials at the Libin Cardiovascular Institute |

# APPENDIX C

## *Success Stories*

### Dr. Anne Gillis, MD, makes lasting impact on field of cardiac electrophysiology

**By Dawn Smith, Libin Cardiovascular Institute**

Dr. Anne Gillis, MD, a UCalgary scholar who is internationally recognized for her contributions to our understanding of the mechanisms behind cardiac arrhythmias has been recognized with a lifetime achievement award.

The Canadian Heart Rhythm Society (CHRS) has announced Gillis, a professor in the Department of Cardiac Sciences at the Cumming School of Medicine (CSM), as the 2021 recipient of its prestigious Annual Achievement Award, created in 2012 to recognize Canadian CHRS members who have made outstanding contributions within the cardiovascular heart rhythm field.

Gillis is deeply honoured to be recognized by her peers.

"Over the last 30 plus years the field of cardiac electrophysiology has evolved in many exciting directions. During that time, it has been a privilege to work with many colleagues locally, nationally and internationally on collaborative research projects, peer review committees, guidelines documents, other health-care initiatives as well as national and international scientific sessions," she says. "Together these initiatives have significantly improved outcomes and quality of life for patients with heart rhythm disorders. In addition, I cherish the many friendships that have developed as a result of these activities".

Gillis is an internationally renowned clinician-scientist whose passion for cardiology began during her second year of medical school at Dalhousie University in Halifax, Nova Scotia. A subsequent elective she took in the Coronary Care Unit of Victoria General Hospital in Halifax solidified Gillis' desire to focus her efforts on helping patients in the then-emerging subspecialty of electrophysiology.

Gillis has spent the bulk of her 30-year career in Calgary, arriving in 1986. She was attracted by the research environment, the people and the proximity to hiking and skiing in the Rocky Mountains and she has stayed for the same reasons.

Gillis is a world-class mentor, researcher, clinician and leader within the Libin Cardiovascular Institute. She has been recognized by her peers on numerous occasions, including as the 2018 recipient of the Canadian Cardiovascular Society's Achievement Award, given in recognition of a lifetime of outstanding contributions to the cardiovascular field.

As a translational scientist and clinical researcher, Gillis has contributed more than 200 articles and book chapters. She is internationally recognized for contributions to the understanding of the mechanisms underlying cardiac arrhythmias and investigating novel ways to treat them.

Gillis has published trailblazing research on the cellular mechanisms of cardiac defibrillation and clinical studies defining the role of atrial pacing for prevention and management of atrial fibrillation (AF), the most common arrhythmia.

In her later work, Gillis collaborated with her colleague, Dr. Wayne Chen, PhD, to investigate the role of calcium-triggered activity and the ryanodine receptor (the microscopic gateway that allows the heart to beat) in how arrhythmias begin; and to examine the role of specific drugs in preventing AF.

Gillis, who is set to retire from clinical practice at the end of 2021, has also contributed to major innovations in health-care delivery. She developed standards for nurse clinician-led device clinics and developed the first AF clinic in Canada. Both have become models for care across the nation.

In 2004, she led the first Canadian initiative to introduce remote monitoring of implantable cardioverter defibrillators and pacemakers. Her efforts have made life easier for patients, who may not have to attend a clinic for heart monitoring.

Gillis is a respected international leader in the field of cardiac electrophysiology, serving as president of the Heart

Rhythm Society from 2012 to 2013. In this role, she led medical, allied health and science professionals specializing in cardiac rhythm disorders from more than 70 countries. She has also held numerous positions on the Canadian Cardiovascular Society Academy board, including vice president and president.

In 1996, Gillis was the first woman in the Department of Medicine at the University of Calgary to be promoted to professor. She has been influential in the development and growth of the Libin Institute as deputy director, a position she held between 2015- 2019.

In that role, Gillis worked closely with Dr. Todd Anderson, MD, the Vice Dean of the CSM and former director of the Libin Cardiovascular Institute.

"Dr. Gillis had such a positive influence on our success during those years," says Anderson. "I greatly appreciate her guidance, wisdom and friendship over the years. We are very proud of her accomplishments and what she means to the cardiovascular community in Canada."

Gillis says her career has been driven by a desire to improve outcomes for patients. She expresses gratitude for her colleagues, including Drs. Brent Mitchell, MD, George Wyse, MD, Henry Duff, MD, PhD, Robert Sheldon MD, PhD, Katherine Kavanagh, MD, and Derek Exner, MD, for helping to create the positive collaborative atmosphere that enabled, in part, her success.

She is also thankful for Alberta Innovates (formerly the Alberta Heritage Foundation for Medical Research), noting the organization's support was instrumental in allowing her to take time away from her busy clinical practice to conduct meaningful research.

Dr. Satish Raj, a clinician-scientist and long-time colleague of Gillis, says the award is a testament to Gillis' commitment to excellence.

"[Gillis] is an outstanding clinician, scientist and educator," says Raj. "As the former program director of the Libin Institute's Cardiac Electrophysiology Program, she trained a generation of heart rhythm specialists who are now working throughout the world. She has also served as a role model and mentor to generations of female cardiologists."

## Libin Cardiovascular Institute researcher receives $1.1M in CIHR project grant to develop AI-based cardiomyopathy diagnostic tool

**By Dawn Smith, Libin Cardiovascular Institute**

Heart muscle diseases, called cardiomyopathies, come in many different forms and often develop differently, so diagnosing a specific type can be challenging. Even in similarly appearing hearts, the cause of the disease may be different, and individuals my require different treatments to prevent serious complications like heart failure, life-threatening heart rhythms or death.

A team of researchers, led by the Cumming School of Medicine's Drs. James White, MD, Alessandro Satriano, PhD, with Dr. Russ Greiner, PhD, of the Alberta Machine Intelligence Institute, is tackling this issue head on with an innovative artificial intelligence (AI)-based diagnostic tool. The tool uses cardiac magnetic resonance imaging (CMRI) to diagnose the presence and type of cardiomyopathy.

The team recently received a $1.1 million Canadian Institutes of Health Research (CIHR) project grant to validate the effectiveness of their software with an international study. Called AID-MRI, involving 2,500 patients from sites in North America, South America, Europe and Asia, the study will examine if the software can learn to effectively diagnose diseases in people with different ethnicities across multiple countries.

The study, one of the largest to demonstrate the value of AI, will apply machine learning techniques to data captured by the Cardiovascular Imaging Registry of Calgary (CIROC), including more than 25,000 CMRI tests, to produce models that can diagnose different cardiomyopathies.

"Over the last several years, there have been new treatments introduced to treat specific causes of cardiomyopathy, but many people aren't getting these treatments because of the difficulty of diagnosis," says White, a professor in the Department of Cardiac Sciences.

The software works by analyzing routinely captured CMRI of an individual's beating heart and comparing its shape and patterns of movement to models built from others suffering from specific types of cardiomyopathies. The AI software considers thousands of data points to provide the most likely diagnosis to physicians within seconds.

"Each heart condition has a unique pattern, or fingerprint, that we can train our AI-based software to recognize," says White. "Ultimately, this can act as a virtual consultant to assist physicians to make the correct diagnosis when it matters most."

The unique data generated by these models can also be used to predict the future occurrence of heart complications, such as heart failure, atrial fibrillation and life-threatening arrhythmias. Researchers are planning to expand the software to identify those at highest risk of developing these complications.

The information can then be used to diagnose the disease and predict what may happen for each individual patient, allowing physicians to match the appropriate therapies to their patients.

"Our approach converts routinely available images generated by any MRI scanner into a standardized data model to assist physicians in making the correct diagnosis and treatment decisions for individual patients," says White. "We are excited to confirm the accuracy of our techniques in an international setting."

## Cardiac surgeon uses innovative techniques to improve patient experience

**By Dawn Smith, Libin Cardiovascular Institute**

It has been couple of tough years for Al Cheney, 75. The retired oil and gas worker's quality of life plummeted since suffering a massive heart attack in 2017.

Suffering with symptoms such as an irregular heartbeat, swelling and difficulty breathing that made mobility difficult, Cheney was diagnosed with heart failure following the heart attack.

He has spent a great deal of time in the hospital – often weeks at a time.

Although Cheney's life improved somewhat after treatment, doctors determined he needed an implantable defibrillator with a special pacemaker lead to help improve his heart function. Cheney received the defibrillator, protecting him from dangerous heart rhythms. However, his cardiac resynchronization therapy implant procedure—which involves adding a pacing lead through the coronary sinus, a special vein in the heart—was not successful because of the anatomy of his heart.

However, in August 2019, Cheney's physician, Dr. Jacques Rizkallah, MD, a young cardiologist who began working in Calgary in 2016, was able to overcome this using a novel technique known as Left Bundle pacing. It was the first time that this surgical technique was performed in Canada.

Rizkallah, who received specialized training at Harvard Medical School, explains that in standard pacemaker implant procedures, doctors insert one or more pacemaker wires into the heart to activate it based on the specific needs of the patient condition.

Although the purpose of a pacemaker is to treat patients with slow heart rates, in some rare cases, activating the heart with the pacemaker can cause it to enlarge and weaken. Known as pacemaker mediated cardiomyopathy, the condition is caused by activation of the heart out of sync.

In the new approach, also referred to as physiologic pacing, the pacing wire is implanted in a specific part of the heart along its normal conduction system, reducing the risk of pacemaker mediated cardiomyopathy and treating heart failure in some cases.

"This allows us to stimulate and activate the heart with the pacemaker the way it is naturally designed to be activated," says Rizkallah.

There are two surgical techniques involved in physiologic pacing: His bundle pacing and left bundle pacing. His bundle pacing places the pacemaker lead closer to the centre of the heart's conduction system along the ventricular septum.

Left Bundle pacing positions the lead in a deeper, specific location in the heart muscle that is more challenging to reach but provides a good alternative for patients in whom the HIS Bundle location isn't technically feasible.

Cheney notes there was significant improvement in his quality of life after the left bundle pacing procedure.

"Everything is better," he said. "I have nothing but good things to say about that surgery."

Although the HIS bundle and Left Bundle pacing techniques are more technically challenging and require more time to perform than the standard pacing methods, Rizkallah is pleased with the results.

"Persevering through these surgeries is very rewarding when we see patients benefit with improvements in their heart function," he says.

**Radiation-free ablation**

Rizkallah was also the first in Western Canada—and amongst the first in Canada—to perform a radiation-free complex ablation, a procedure that uses special catheters to burn or freeze circuits in the heart that cause abnormal rhythms.

Most physicians rely on fluoroscopy using X-rays to visualize their tools in the heart when performing complex ablations, but this standard procedure has a potentially serious drawback. Both patients and physicians are exposed to radiation, with the amount dependent on the length of the procedure.

Over time, the cumulative exposure increases the risk of cancer for health care providers. To shield themselves and reduce radiation exposure, physicians wear a cumbersome, lead apron weighing about 30 pounds while performing ablations.

Not using fluoroscopy during ablations avoids all of those complications, explains Rizkallah.

Although fluoroscopy-free ablations are performed at many centres in Canada, Rizkallah is employing it for complex procedures, such as those that require the atrial septum of the heart to be punctured to treat arrhythmias like atrial fibrillation.

The approach uses ultrasound imaging within the heart as a guide, a method that is performed at just a few of the largest hospitals in Canada. The zero-fluoroscopy ultrasound guided technique has only been around for a couple of years and is harder to learn and implement.

"The first case was a little nerve wracking, but exciting," says Rizkallah. "I was fortunate to have access to the right technology at our institution, which allows us to be innovative."

Rizkallah says his colleagues are also keen on learning the new method.

"I work with a great group of colleagues that are always looking to adopt innovative ways to deliver the best care to our patients."

## High salt diet can help treat heart condition called POTS, researcher finds

**By Dawn Smith, Libin Cardiovascular Institute**

Aisha Taylor, 24, knows what it is like to suffer with unexplained symptoms.

In Grade 9, she was diagnosed with mononucleosis and suffered with fatigue, difficulty exercising and dizziness. The then-athlete found herself breathing heavily while climbing stairs and getting sick for days after a workout with her school's track team.

But even after recovering from mononucleosis, the fatigue and other symptoms persisted. Taylor also noticed that her heart wasn't beating normally.

"I had an Apple watch and I remember my heart rate was 180 for hours at a time," she says. "Even when I was lying down, it wouldn't slow down."

Over the next few years Taylor received numerous heart tests, including an echocardiogram, but no one could determine the cause of her high pulse rate, fainting and unwellness.

Although it was difficult, Taylor continued with her life, earning her undergrad degree and starting her master's program in psychology at the University of Lethbridge. She also persisted in seeking answers for her illness. Then a cardiologist noticed Taylor rarely stood — or sat — completely upright. She often leaned or supported herself while in these positions.

He asked me if I was dizzy, and I thought, 'What a silly question, everyone feels like this when they stand up. That's when I began to realize that what I was feeling wasn't normal.

That physician took her heart rate upon standing and noticed it increased. He suspected it might be postural orthostatic tachycardia syndrome (POTS), a condition that affects up to one per cent of the population, the vast majority young women of childbearing age. POTS causes a host of often-debilitating symptoms like fatigue, dizziness, tachycardia and fainting.

Taylor was referred to Dr. Satish Raj, MD, a cardiologist and researcher at the Libin Cardiovascular Institute at the Cumming School of Medicine, an internationally recognized expert in POTS, who diagnosed her with the condition.

The young woman was pleased to have a diagnosis after suffering for about eight years.

"It was a huge relief to know these weird symptoms aren't in my head, there is a common cause for all of them," says Taylor, explaining as a teenager, she often felt lazy for all the time she spent in bed.

**High sodium diet and lots of water**

Taylor is now on a regimen for her POTS that includes increasing her salt intake and drinking at least three litres of water per day.

The high sodium diet may be contrary to traditional ideas about heart health, but it's a common treatment for POTS patients, says Raj. Until now, there were no studies proving its efficacy.

A study led by Raj on high dietary sodium intake in this patient group was published recently in the *Journal of the American College of Cardiology*.

"Historically, for a lot of autonomic disorders, and certainly POTS, our approach has been to try to increase blood volume by 'filling the tank.' We advise patients to drink lots of water and take lots of salt," says Raj. "This study provides evidence that it does work."
In previous work, Raj showed that individuals with POTS have a 12 to 13 per cent lower blood volume, on average, than their healthy counterparts.

"No one has really been able to discover why, but regardless, we know blood volume is low in these individuals," says Raj.

**A useful treatment**

Participants in the study, which included individuals with POTS and healthy female participants, were placed on both low sodium and high sodium diets for one week. Researchers monitored their heart rate and levels of noradrenaline, a naturally occurring substance that regulates blood vessel muscle contraction and the force and rate of the heart's contraction, in a standing and lying position.

Participants also rated their symptoms.

Raj's team found that the high sodium diet in POTS patients led to an increase in blood plasma volume and a decrease in noradrenaline heart rate upon standing.

"It didn't make a POTS patient look exactly like a healthy participant, but it brought them closer and is a useful treatment," says Raj. "Their symptoms seemed to improve as well."

Taylor is thankful to have finally found a treatment that eases some of her POTS symptoms, noting that when she adheres to the high sodium diet, she feels generally better.

"Overall this is really helpful for me," says Taylor. "I feel a lot less nausea and fewer flu-like symptoms. I am not cured, but I am managing."

## Libin cardiologist receives Hal O'Brien Rising Star Award

**By Dawn Smith, Libin Cardiovascular Institute**

Clinician-scientist Dr. Robert JH Miller, MD, is one of three recipients of the 2022 Hal O'Brien Rising Star Award, given to researchers working in the field of nuclear medicine and molecular imaging.
Miller was the sole Canadian chosen, and the only recipient

ever to receive nominations from both the American Society of Nuclear Cardiology and the SNMMI Councils and Centers of Excellence. The award allowed Miller to attend and present at the prestigious High Country Nuclear Medicine Conference in early March.

He is pleased to have been chosen for the prestigious award.

"It is an honour for anyone outside of the United States to be selected for this award," says Miller. "And being chosen by the two society's simultaneously is validation of all of my recent work in the field."

Miller, a clinical assistant professor in the Department of Cardiac Sciences at the Cumming School of Medicine, was recognized for his research interests in improving the use of nuclear cardiology in diagnosis and risk prediction, by leveraging advanced quantification techniques as well as machine and deep learning techniques.

Miller specifically presented on recent advances in positron emission tomography (PET) myocardial perfusion imaging (MPI), which shows how well blood flows to the myocardium, or muscle of the heart. He also discussed methods to quantify myocardial blood flow with single photon emission computed tomography (SPECT) to better predict a patients' likelihood of experiencing cardiac events.

Both SPECT and PET are quite common and uses a radioactive tracer to produce images of the heart to determine if a patient has coronary artery disease.

Miller, the medical director of nuclear cardiology and cardiac CT, says about 500,000 scans are performed annually in Canada. He added because the tests are common, it's critical to maximize their value by leveraging improvements in artificial intelligence and machine learning, which can be used to find patterns and subsequently improve diagnostic accuracy and predict risk of heart attacks.

Miller says his work in this area is important, as it allows health care providers to better determine which patients need more aggressive treatments based on their risk and which patients can be re-assured by a low risk of heart attacks.

Miller is involved with other projects, including one using machine learning techniques to identify patients most likely to benefit from revascularization, a procedure that can restore blood flow in blocked arteries or veins. Another project is helping determine which patients can have limited examinations, to reduce radiation exposure and costs.

## Cardiac surgeons bring innovative technique to Calgary

### Neochord device allows for less risky mitral valve repair

**By Dawn Smith, Libin Cardiovascular Institute**

Mitral regurgitation occurs when the heart's mitral valve doesn't close properly, which allows blood to leak backwards through the mitral valve. This condition usually progresses slowly over time and may lead to heart failure, causing symptoms like shortness of breath, fatigue, swelling, heart palpitations, cough and light-headedness.

Degenerative mitral valve disease is a relatively common cardiovascular disease impacting about two per cent of the Canadian population. If left untreated, patients are at increased risk of death. Patients with this condition have historically required open-heart surgery or minimally invasive surgical procedures to repair their mitral valve.

In addition to a lengthy recovery time following open-heart surgery, being put on a heart-lung bypass machine, which is necessary both for conventional and minimally invasive mitral valve repair, puts stress on numerous organ systems, including the lungs, and increases the risk of stroke and heart disease.

Calgary surgeons now offer a less-risky alternative to repairing mitral valves that eliminates the need for the heart-lung bypass machine. The Neochord device allows surgeons to repair the mitral valve while the heart is still beating via a small incision between the ribs.

"This is a new technology that has been used in only a handful of cases in North America," says Calgary surgeon Dr. William Kent, MD, one of two local cardiac surgeons trained to use the Neochord. "It's an excellent alternative for people who are at high risk of conventional surgery."

Kent and his colleague, Dr. Corey Adams, MD, specialize in minimally invasive surgery. They, along with their surgical team including anaesthesiologists, nurses and assistants, recently completed a series of four surgeries using the new technology after receiving training in Europe in the Neochord procedure.

Calgary is the second site in Canada to undertake the procedure and the first in North America to complete a series of patients.

Red Deer resident Robert Toews, 77, was the first to undergo the procedure in Calgary in April 2022. One month post surgery, he is pleased with his recovery.

“I feel a bit tired, but overall, I am getting back to normal,” he says, explaining he was a candidate for the surgery after developing a heart murmur in 2020.

Toews spent just two days in the hospital following his surgery.

Lethbridge resident Irene Tosczak, 71, had a similar experience, although her case was a bit more complicated in that it was a re-repair of her mitral valve.

“My first valve replacement was a minimally invasive procedure in 2018, and I spent six days in the hospital recovering,” she says. “This time I went home three days after surgery. I was in awe of what they can do and really how easy it was.”

Tosczak is also recovering well.

Adams is excited to be part of the surgical innovation, which cuts down surgery time, gets patients back to their normal routine faster and cuts down on the risk of cardiovascular complications.

“It feels great to offer something cutting edge to Calgarians,” says Adams. “It’s amazing to see patients going home as soon as two days post-op, without the symptoms they came in with, such as shortness of breath.”

Adams and Kent say a whole team was involved in offering the new procedure.

“We couldn’t have done this without the support of the surgical team, the care team in the Cardiovascular Intensive Care Unit, our leaders and administration in the Department of Cardiac Sciences,” says Adams. “It’s been nice to see everyone take pride in this innovation.”

The team is planning to continue doing the procedure and is being considered as the North American training site for the new technology.

There are about 230 minimally invasive mitral valve cases performed each year in Calgary. The team expects up to 20 per cent of patients will be candidates for the new procedure.

## Local clinicians team up to perform cutting-edge cardiac therapy

### Calgary man receives first STAR treatment in Alberta

**By Dawn Smith, Libin Cardiovascular Institute**

A Medicine Hat man is the first in Alberta to receive stereotactic arrhythmia radioablation (STAR), a cutting-edge treatment for his ventricular tachycardia (VT).

VT is a dangerous heart condition caused by abnormal electrical signals in the heart’s ventricles (lower chambers) that sometimes causes the heart to race. The rapid rhythm means the heart can’t pump adequate blood to the lungs and body. VT is a key factor in sudden cardiac death, in which the heart suddenly stops beating.

The condition is conventionally treated with medication; implantable cardiac defibrillators (ICDs) that shock the heart into normal rhythm; and ablation, which uses heat or cold energy delivered through a catheter to burn or freeze the damaged heart tissue causing the faulty electrical signals that lead to the abnormal rhythms.

STAR is a novel treatment that uses radiation, rather than conventional ablation, to treat the heart. The technique of cutting-edge radiation delivery employed in STAR is increasingly used to treat some forms of cancer but has only been used in cardiac ablation in a handful of cases in Canada.

Gordon Seitz, 72, is doing well after undergoing the STAR procedure on April 21, 2021.

"I was able to go home the day next day," he says. "My heart symptoms are better, and I have been able to get back to doing my yard work."

A multidisciplinary team of clinicians, including cardiologist and researcher Dr. Vikas Kuriachan, MD, senior medical physicist Dr. Nic Ploquin, PhD, and radiation oncologist Dr. Salman Faruqi, MD, led the team responsible for bringing the procedure to Calgary. The team was highly collaborative, with individuals in several departments, including cardiology, radiology, radiation oncology, medical physics and radiation therapy, taking part.

Worldwide, only about 100 patients have undergone the STAR procedure since it was introduced in 2012.

"It is very exciting," says Ploquin. "It's a relatively quick and easy procedure, and we can expect to see the results fairly quickly."

Ploquin notes because the radiation is very precise, collateral damage within the heart is minimized. It also only takes one treatment, rather than the multiple radiation treatments often required to treat cancer.

Kuriachan explains although the procedure may not cure patients, it can improve their quality of life. It is also less invasive than traditional ablation and results in quicker recovery. Indeed, patients can often go home the same day they are treated.

"Traditional ablation treatments can take more than eight hours with usually general anesthesia and overnight hospital stay. The STAR treatment takes less than an hour," he says. "Patient recovery time is much quicker and the benefits are immediate."

Seitz is a long-time heart patient. The man has severe scarring on the heart, potentially caused by a virus, that began bothering him more than 15 years ago.

In 2005, he received an ICD to prevent a possible deadly cardiac arrest. In early 2020, Kuriachan performed a conventional ablation treatment on Seitz, which kept Seitz in hospital for several days as he recovered.

When Seitz's symptoms, including dizziness, fatigue and breathlessness returned, Kuriachan considered him an excellent candidate for the novel therapy.

Kuriachan says although the full benefits of the procedure may not be evident for several weeks, he is excited about the potential of the treatment.

"If this pans it, it could be a very disruptive kind of change that no one ever saw coming," he says. "It could totally change the way we do things."

Faruqi is pleased with how the team came together over the past two years.

"There are so many disciplines involved," he says. "It is very neat to collaborate with teams of health care providers I haven't previously worked with and see it all come together the way it did."

Seitz's treatment won't be the last STAR procedure undertaken in Calgary. The group is planning to follow about 20 patients as part of a local research study to determine long-term impacts of this procedure, which, to date, has been used as a treatment for individuals who don't respond to medication and may not be candidates for more invasive traditional ablations.

Seitz is pleased to be part of that study.

"If my symptoms don't improve, at least [researchers] have learned something that might help someone else," he says.

This project was funded through the Libin Cardiovascular Institute.

## New device gives hope to heart surgery patients

### Therapy provides options for repairing the aortic arch

**By Dawn Smith, Libin Cardiovascular Institute**

The aorta is our largest artery and is critical for providing blood to vital organs throughout the body. It is made up of several distinct segments, including the aortic arch as it curves to connect the ascending and descending aorta.

A weakening in the walls of the aortic arch can lead to the development of a bulge, or aneurysm, putting patients at risk of a dissection, or tearing of the walls of aorta that

cause it to leak, or a potentially deadly rupture.

Surgeons have developed techniques for rebuilding the aortic arch, which can be challenging due to its location deep in the chest and its shape. These techniques have historically required open-heart surgery – until now.

Surgeons from the Libin Cardiovascular Institute's Calgary Aortic Program (CAP) recently made history by performing the first total endovascular arch replacement in Canada utilizing the new Bolton Medical Endovascular Arch device with virtual support from clinicians and specialists in Florida. The technique is performed using wires and catheters, cutting down on recovery time.

"We reconstructed the whole aortic arch without open-heart surgery," says Dr. Scott McClure, MD.

The cutting-edge procedure is a delicate one requiring expertise from several disciplines, including cardiac and vascular surgeons.

Surgeons carefully inserted the fabric device, which contains supports for the vessels called stents, through tiny incisions in the neck and groin. They then carefully positioned it before deploying the stents individually for the aortic arch and for each large vessel branching off, called the head vessels.

The result is that the aneurysm is completely sealed off by the fully supported aortic arch and head vessels.

**Indications for this surgery**

According to McClure, about 25 per cent of patients who undergo surgical repair of their aorta require future surgeries to repair other areas, as the aortic weakening is irreversible.

Depending on the health of the patient, it can sometimes be too risky for additional surgery using open-heart techniques, leaving patients with few options. McClure says because the total endovascular arch replacement is less invasive, it provides an option to such patients, reducing the risk of surgical complications and allowing for a faster recovery.

That was the case for Bob Bennett, 71, whose heart problems began in 2017 when he suffered an aortic rupture. Since then, he has undergone several procedures, including a second open-heart surgery to repair his aorta.

Bennett was happy to be the first patient in Calgary to receive the new device.

"I recovered faster from this surgery than the others and was able to go home sooner," says Bennett, who notes he is feeling quite well, other than being tired.

McClure is pleased with the results.

"The surgery solved a life-threatening problem that we otherwise would have had to just hope for the best," says McClure, adding the prognosis for the patient is fantastic. "I am happy for the patient and proud of CAP. We wouldn't have been able to do this without our multi-disciplinary team."

McClure, along with vascular surgeons Dr. Kenton Rommens, MD, and Dr Randy Moore, MD, are part of CAP, a collaboration that was critical in this delicate surgery, according to Moore.

"The successful completion of this first case in Canada demonstrates the incredible successes that can be achieved through focused teamwork," says Moore. "It represents years of collaboration between our groups."

Rommens says it's an exciting time in cardiac and vascular surgery, as collaborative technology is improving all the time.

"It provides us with another option to treat difficult problems for patients, who, in the past, were told they were out of options," says Rommens. "Now we have something to offer these patients."

Moore agrees.

"Advanced endovascular techniques represent the forefront of innovation in both cardiac and vascular surgery and continue to offer ever-increasing patient populations minimally invasive options for treatments that were not possible even a few years ago," he says. "This has the potential to not only extend lives, but also to improve the quality of those patients experiencing these devastating aortic pathologies."