INTERVENTIONAL CARDIOLOGY FELLOWSHIP

LENGTH OF FELLOWSHIP: One year training in interventional cardiology (after Core Cardiology)

ACADEMIC AFFILIATION: McGill University, MUHC cardiology program.

NAME OF HOSPITALS: Royal Victoria Hospital.

FELLOWSHIP PROGRAM DIRECTOR: Dr. Jean-Philippe Pelletier

FUNDING: Candidates must secure funding (as per PGME guidelines) to apply for this fellowship.

NUMBER OF FELLOWSHIP POSITIONS*:* Maximum 3 per year.

PROGRAM ENTRY REQUIREMENTS: Interventional Cardiology fellows must have completed Cardiology core training at an institution with Royal College certification or equivalent for foreign fellows. Knowledge of diagnosis and management of ischemic heart disease is considered part of core cardiology training, and the ability to function as a cardiologist is a prerequisite for Interventional Cardiology training. Patient management issues such as heart failure, cardiac arrhythmias, hypertension, and stroke prevention all intersect with management of ischemic heart disease. The ability to perform an appropriate history, physical examination and conduct appropriate investigations related to cardiovascular symptomatology or disease is assumed to be integral to cardiology training.

BACKGROUND: In 2006, the MUHC concentrated all cardiology interventional activities at a single site (the Royal Victoria Hospital), and opened three state of the art cardiac catheterization laboratories, including a bi-plane unit. The two single-plane rooms were entirely updated in 2013 with new flat-plane image intensifiers, one of which is large enough to allow for structural and peripheral vascular interventions. Current equipment allows the performance of diagnostic studies (coronary disease, cardiomyopathies, valvular disease, pericardial disease, adult congenital disease), including ultra specialized diagnostic procedures such as intravascular and intracardiac ultrasound, optical coherence tomography, instantaneous flow reserve and fractional flow reserve. Therapeutic interventional procedures performed at the MUHC include coronary angioplasty and stent implantation, rotablation, coronary lithotripsy, excimer laser atherectomy, use of ECMO and percutaneous ventricular assist devices (Impella, Protek Duo, Tandem Heart), PFO / ASD & VSD closure, LAA closure, balloon valvuloplasty, percutaneous valve implantation, valve percutaneous clipping (mitral, tricuspid), pericardiocentesis, and CTO / CHIP interventions. This concentration of activities and standardization of care, with much tighter integration and professional formation of support staff, i.e. nursing and X-Ray technologists, has allowed us to provide level three interventional training for qualified cardiologists (ACC interventional task force). As well, it has allowed us to recruit well trained interventionists, with varied procedural and research interests.

RESEARCH ACTIVITY: Research in the MUHC catheterization laboratories is ongoing, with various locally initiated studies and publications. We have a full-time research nurse, and are also involved in

several ongoing collaborative trials. The efforts of Drs. Piazza, Dandona, Pelletier, Spaziano, Akl and Martucci have given a new impetus to this effort which will continue to develop.

MISSION: Cardiac catheterization laboratories' activities are central to hospitalized tertiary care cardiology. There are three major objectives pursued.

1. The first is clinical. The intent in providing interventional training is to prepare suitable candidates for independent practice) of diagnostic and interventional coronary work. Diagnostic studies include aortic, coronary, and peripheral angiography, use of instantaneous / fractional flow reserve, intravascular imaging (IVUS, OCT), as well as hemodynamic investigation of valvular, cardiomyopathic and pericardial disease, including performance of trans-septal puncture, endomyocardial biopsies and pericardiocentesis. As part of our clinical services, the cath lab also provides tight integration with cardiovascular surgery, providing diagnostic information and guidance in therapeutic intervention to our cardiologist and surgical colleagues using a "heart team" approach. Therapeutic procedures include percutaneous coronary intervention and stent implantation, aspiration thrombectomy, use of rotational and laser atherectomy / Shockwave coronary lithotripsy, and CTO desobstruction (antegrade and retrograde). Hemodynamic support modalities range from intra-aortic balloon conterpulsation to Impella / HeartMate / ProtekDuo percutaneous ventricular assistance and ECMO. A wide range of percutaneous structural procedures are performed (for which a separate fellowship is offered by Drs. Martucci and Piazza), including coarctation stenting, PFO / ASD and VSD closure, LAA closure, balloon valvuloplasty valvular clipping (MitraClip) and valvular implantation (TAVI).

2. The second is teaching and formation: Fellows in our program will receive training equivalent to ACC interventional level three formation (Royal College certification is currently being implemented). Extensive hands-on exposure to all aspects of practice in the cath lab is offered (including as primary operator). Other teaching opportunities include bi-weekly cath lab journal clubs, and weekly cath lab clinical conferences, where interesting, complex or controversial cases are reviewed in a group setting (heart team format).

3. The third is research. A number of original and collaborative trials are ongoing. We currently use a comprehensive, research-oriented procedural and clinical database (CardioReport). Fellows are strongly encouraged to participate in departmental research activities, while being given great latitude in pursuing projects / topics that interest them and with their choice of mentor, with commensurate supervision and protected study / research time.

Thus the candidate will develop a strong mastery of the various diagnostic and interventional technique's indications, contraindications, limitations, interpretation and clinical use. He will learn to work within a multidisciplinary team (cardiologists, surgeons, anesthetists, nurses and technicians, and trainees of various levels). He will develop appropriate clinical judgment, and self-discipline in further learning and possibly research activities.

TEACHING FACULTY: □ Jean-Philippe Pelletier - interim cath lab chief, training program director (diagnostic and interventional coronary disease, support devices) □ Sonny Dandona (as above, plus cardiovascular genetics, renal denervation, SCAD, CTO desobstruction, CHIP intervention) □ Elie Akl

(as above plus intracoronary imaging expertise) Giuseppe Martucci (as above plus structural, adult congenital and valvular intervention) Nicolo Piazza (as above plus structural and valvular intervention) Marco Spaziano (as above plus structural and valvular intervention)

ACADEMIC FACILITIES: The MUHC cath lab facilities are concentrated at the RVH pavilion (Glen site). The facilities consist of three cath lab suites, including a biplane room, located in a separate, closed and air conditioned suite, with integrated secretariat, dedicated fellow's teaching and conference room with AV equipment (including teleconference capability, full access computers to hospital, library database and internet, as well as dedicated PACS stations, allowing immediate access to angiographic records and images). As well, there is a fully monitored and nursing staffed fourteen bed ward for daytime pre and post cath activities (an additional 6-8 beds with overnight staffing are imminent), a dedicated staff room and suitable sanitary accommodations. This produces a privileged working and learning environment, with close access to a reserved reading space and immediate, moment to moment access to staff interventionalists. One would be hard put to find a better physical environment to facilitate learning. Technical skills are acquired in the labs with the immediate presence and active mentoring and physical demonstration and guidance of the staff MD in the cath lab. Our labs yearly perform roughly 3,000 or more procedures, including 1,500+ interventional procedures.

CURRICULUM: The interventional cardiology fellowship is a 1-year program providing training in advanced invasive diagnosis and management of coronary artery disease, and the various complications deriving from ischemic heart disease, such as heart failure or valvular pathology. The curriculum will focus on cognitive skills, technical skills, education and research, as described below using the Royal College CanMEDS framework©. Progress of the fellows is assessed regularly, and feedback is given every 3 months to trainees.

At the end of the fellowship, the trainee will have acquired the following competencies:

Cognitive skills: Cognitive skills are acquired both by experience in clinical care on the wards, clinic, and in the cardiac catheterization laboratory as well as by structured instruction in rounds and other structured sessions. Many of the cognitive skills will be acquired by discussion with staff and colleagues and attendance and presentation at rounds. Participation in a structured research project will develop the skill to critically appraise the science behind clinical guidelines and clinical decision-making.

MEDICAL EXPERT: Adult Interventional Cardiologist trainees are able to…
Function effectively as consultants, integrating all of the CanMEDS Roles to provide optimal, ethical and patient-centred medical care • Demonstrate problem solving and clinical decision-making, including the ability to correlate, evaluate, and prioritize information acquired by clinical, hemodynamic and/or angiographic assessment; formulate an appropriate problem list; develop and implement a diagnostic and therapeutic plan using appropriate knowledge derived from clinical appraisal of relevant literature • Demonstrate use of all CanMEDS competencies relevant to Adult Interventional Cardiology • Identify and appropriately respond to relevant ethical issues arising in patients undergoing interventional procedures

- Demonstrate the ability to prioritize professional duties when faced with multiple patients and problems.
- Demonstrate compassionate and patient-centered care
- Recognize and respond to the ethical dimensions in decision-making having to do with interventional procedures
- Perform appropriate and accurate invasive diagnostic and therapeutic procedures safely

Establish and maintain clinical knowledge, skills and attitudes appropriate to Adult Interventional Cardiology

- Cardiac catheterization and coronary arteriography
    - Indications and contra-indications
    - Radiation principles and safety
    - Technical aspects
    - Vascular access techniques (arterial: radial, brachial, femoral - venous: jugular, brachial, femoral), including use of adjunctive aids (ultrasound, micropuncture catheters, fluoroscopy)
    - Measurement and interpretation of hemodynamic data (pressure measurements and waveforms, gradients, cardiac output, assessment of valve stenosis and regurgitation, shunt determinations)
    - Physiological and pharmacological maneuvers

Demonstrate knowledge of adjunctive diagnostic techniques

- Intracoronary imaging, including intravascular ultrasound (IVUS) and optical coherence tomography (OCT), indications and contra-indications
- Coronary physiology and the techniques used for its evaluation
- Integration of evidence-based medicine to properly apply physiology and IVUS / OCT to guide intervention

Demonstrate knowledge of coronary artery disease

- Normal coronary anatomy and possible variant anatomy, and appropriate catheter selection and views for its demonstration
- Physiology of normal and abnormal coronary blood flow
- Atherosclerotic lesion classification and predicted risk/success of percutaneous coronary interventions
- Adjunctive pharmacotherapy and its indications and side effect profiles
- Revascularization procedures: percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG), and their indications, contraindications and benefits
- Devices to treat coronary artery disease, such as balloons, stents, scaffolds
- The importance of gender differences in the diagnosis and percutaneous management of coronary artery disease
- PCI and chronic stable angina / acute coronary syndromes (unstable angina, non-ST elevation MI-NSTEMI) / acute ST-elevation myocardial infarction (STEMI) / post-myocardial infarction management / treatment of potential complications in all subgroups
- Intervention in left ventricular (LV) dysfunction
- Trans-brachial and trans-radial intervention
- Intervention in specific anatomic subgroups including but not limited to chronic total occlusion, thrombotic lesions, bifurcation lesions, calcified and tortuous coronary artery anatomy, ostial lesions, long lesions and small vessels, coronary bypass grafts and left main lesions

Demonstrate knowledge of medical and peripheral vascular complications of cardiac catheterization and angiography

- Risk factors for, diagnosis and treatment of renal insufficiency/contrast reactions
- Risk factors for and management of local and systemic bleeding, hematoma, retroperitoneal hemorrhage, forearm compartment syndrome, pseudoaneurysm/arteriovenous (AV) fistula, thrombotic occlusion, arterial perforation/dissection and atheroembolism
- Risk factors for and management of neurologic complications
- Risk factors for and management of drug reactions
- Infections
- Appropriate use of vascular closure devices and their complications

Demonstrate knowledge of Valvular heart disease

- New, evolving techniques of percutaneous valve replacement and repair
- Invasive evaluation of aortic, mitral, pulmonic, and tricuspid valve disease

Demonstrate knowledge of Congenital heart disease

- Intracardiac shunting: hemodynamics and pathophysiologic effects
- Evaluation of pressure and volume overload conditions related to CHD

Demonstrate knowledge of Congestive heart failure and cardiomyopathies

- Interventional diagnosis and management of cardiomyopathies
- Indications for endomyocardial biopsy (with and without prior cardiac transplantation)
- Invasive diagnosis and interventional management of hypertrophic cardiomyopathy (obstructive and non-obstructive) and restrictive cardiomyopathy

Demonstrate knowledge of Pulmonary vascular disease

- Normal pulmonary vascular physiology
- Hemodynamics of pulmonary hypertension
- Pharmacology of pulmonary vasodilator agents
- Pulmonary embolism
- Pulmonary arterial hypertension: natural history, invasive diagnosis and management
- Secondary causes of pulmonary hypertension: etiology, invasive diagnosis and management

Demonstrate knowledge of Pericardial disease

- Pericardium - Normal anatomy and function
- Effect of pericardial disease on cardiac hemodynamics and function
- Pericarditis: acute, chronic, and relapsing
- Post-cardiotomy syndrome
- Invasive evaluation and treatment of pericardial effusion and tamponade, including pericardial puncture and drainage
- Invasive evaluation of pericardial constriction, and its differentiation from restrictive cardiomyopathy

Demonstrate knowledge of Mechanical support devices

- Physiology and indications of mechanical support devices including but not limited to intra-aortic balloon pump (IABP), left ventricular assist device (LVAD) and percutaneous cardiopulmonary support (CPS)
- Approach to cardiogenic shock, pre- and post-intervention

Demonstrate knowledge of Complications of procedures related to interventional cardiology

- Complications of percutaneous coronary interventions and technologies
- Properties of adjunctive anti-platelet, anti-thrombotic and fibrinolytic therapies
- Management of cardiac arrest, severe arrhythmias, coronary dissection and perforation, sub-acute closure and stent thrombosis, acute coronary vasospasm, no-reflow and coronary air embolism

- Diagnosis and management of embolized stents or other entrapped equipment, using snares and other retrieval devices

TECHNICAL SKILLS

The Interventional Cardiologist will demonstrate an understanding of the indications, contraindications, complications, and interpretation of the following, and will have expertise and technical competence in the performance of the following:

- Coronary artery angiography
- Ventriculography / Aortography
- Right-left heart pressure measurements
- Vascular access (arterial and venous)
- Vascular closure
- Endomyocardial biopsy
- Invasive coronary physiology assessment
- Intravascular ultrasound and Optical Coherence Tomography examination
- Pericardiocentesis
- Temporary transvenous pacing
- Intra-aortic counterpulsation
- Use of advanced percutaneous ventricular support devices (such as Impella, ECMO)
- Use of percutaneous coronary interventions: balloon and stent implantation
- Use of distal protection devices
- Use of microcatheters
- Use of aspiration catheters
- Use of plaque or restenosis modifying devices (such as rotational atherectomy, coronary lithotripsy, laser atherectomy)

COMMUNICATOR

- Describe an interventional procedure, including risks, appropriateness and rationale, to a patient
- Obtain informed consent appropriately
- Complete a comprehensive written report outlining findings and suggested management plan
- Provide appropriate post-procedure teaching and management plan discussion to patient and family
- Participate actively in teaching sessions
- Prepare and present rounds / journal clubs as scheduled

COLLABORATOR

- Work with the house-staff team in the care of patients
- Participate in the performance of the invasive studies / procedures
- Understand and support the roles of allied health professionals (nurse, XRay technologist) in the cath lab
- Work with the treating Cardiologist to assess, plan, provide and integrate care for individual patients or groups of patients
- Demonstrate an understanding of the role of the cardiac surgeon in the optimal choice of revascularization in particular subsets of patients.

- Respect differences and address misunderstandings and limitations in other professionals
- Recognize one's own differences, misunderstanding and limitations that may contribute to interprofessional tension

SCHOLAR

- Conduct or contribute to an interventional cardiology research project or related scholarly activity
- Access and interpret evidence relevant to the practice of Adult Interventional Cardiology
- Critically review relevant published material at Journal Club
- Educate other physicians, other health professionals, members of the public, or government officials about aspects of Adult Interventional Cardiology
- Recognize gaps in knowledge regarding patient problems and develop strategies to fill the gap through reading and consulting other members of the health care team
- Contribute knowledge learned to service rounds

PROFESSIONAL

- Apply the principles of safe use of cath lab equipment as it relates to radiation safety for the operator, cath lab staff and patient
- Deliver care with integrity, honesty and compassion
- Understand the professional, legal and ethical codes to which physicians are bound

FELLOWS DUTIES AND RESPONSIBILITIES: It is recognized that different fellows may acquire technical skills at somewhat different rates. As a result, the evaluation of technical skills will not be based simply upon the number of procedures performed. Ultimately, the Fellowship Program Director will be responsible for evaluation of technical skills acquired by each trainee. Nevertheless, there are a certain minimum number of procedures required in order to have adequate exposure to techniques and complications of interventional cardiology. Thus, the fellow will be expected to perform at least 300 diagnostic studies as primary operator (including right & left heart catheterization), and at least 250 coronary interventional procedures as primary operator. The fellow will keep a formal journal of completed procedures. As well as on the above mentioned skills, the fellow will be evaluated formally every 3 months on the following criteria: competent clinical follow-up, availability and reliability, complications, and quality of interpersonal (patients, staff and peers) and interdisciplinary relations, initiative, teaching and mentoring ability.

The fellow will be expected to arrive at work at 07:30 every working day, except for specified out of lab teaching opportunities (conferences, research activities) holiday or illness. The fellow will participate in on-call duties for the cath lab, as assigned by the program director (this schedule is very flexible, and will vary as per the number of fellows enrolled). The fellow will occasionally be asked to cover general cardiology call at the RVH Glen site, under specific circumstances (such as unexpected shortage of general cardiology fellows.

The fellow will be responsible for selecting cases for the weekly hour long heart team cath conference, with case presentations, including all major complications or difficult clinical cases during the preceding week. The fellow will also collaborate with formal cath lab teaching to cardiology trainees, including that given during dedicated academic half-days. Along with general cardiology residents rotating through the cath lab, they will select and present articles during the biweekly cath lab journal club. The fellow will also be expected to prepare concise presentations on core topics in interventional cardiology (using ACCSAP as guide), presented to attending staff and cardiology fellows bi-weekly, alternating with the journal club.

Given the above, we truly believe that our group has acquired the necessary infrastructure and physician experience and competence to now offer selected candidates an instructive and rewarding learning experience, at the end of which they will fully meet the necessary qualifications required by the appropriate governing bodies