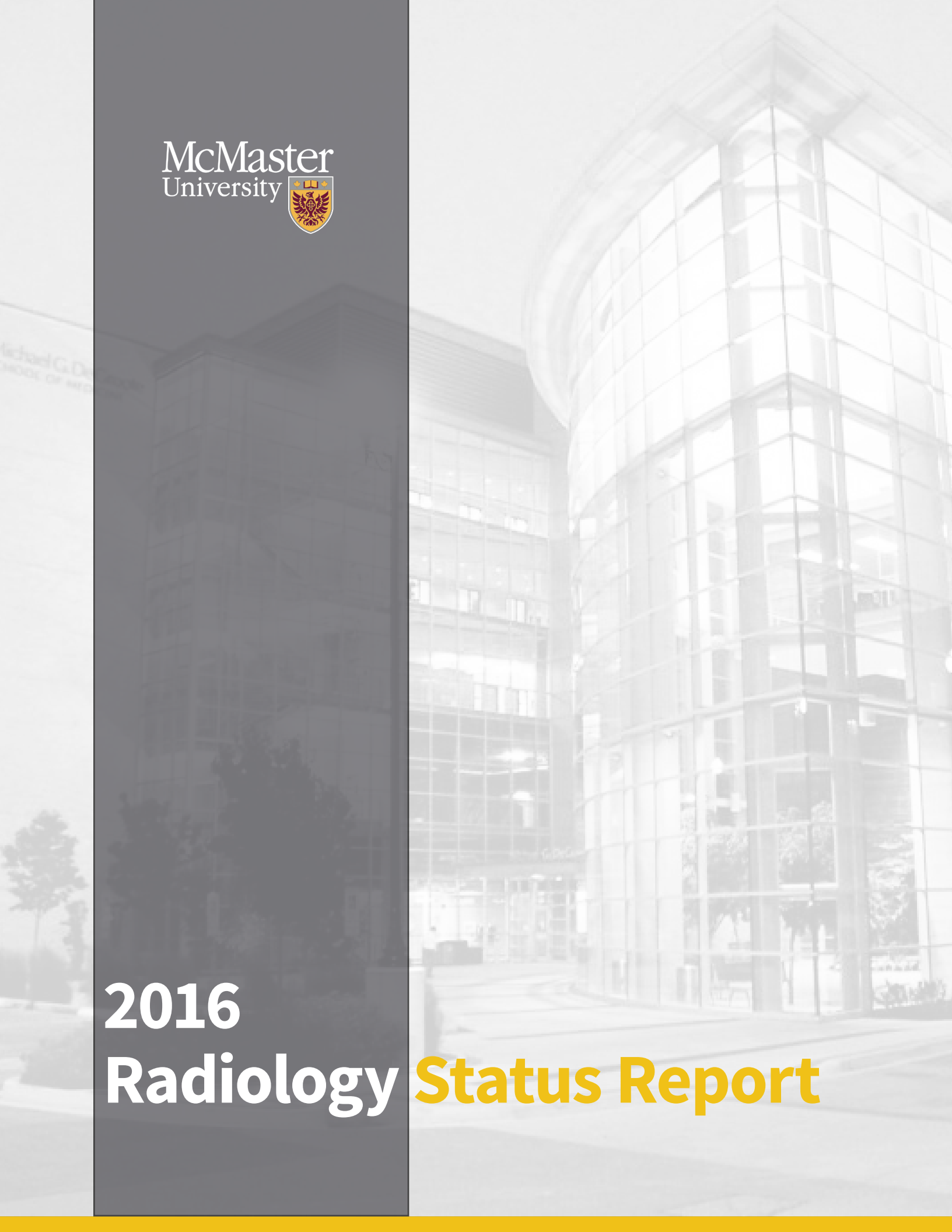
McMaster University



2016 Radiology Status Report

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Message from the Department Chair

I have the great honour to present the report of our progresses and achievements over the past five years, during which our department has grown and rejuvenated.

Our goal is to deliver the best quality imaging service to our patients and referring physicians, in maintaining the highest level of clinical and academic excellence. We are implementing our departmental vision by engaging our radiologists and nuclear medicine physicians, promoting education and research, and generating passion and enthusiasm. To achieve this transformation, we have improved the recruitment model; we now require that all of our new physicians be fellowship trained in a subspecialty and that they join our academic department at a full time rank. Our department is younger, one of the youngest at Hamilton Health Sciences. Our senior radiologists are retiring or changing their career profile to give way to highly skilled subspecialty colleagues and we are close to achieving 100% of our subspecialty transformation.

The implementation of an academic practice plan has brought stability and independence to the academic leadership of the department, while giving equal opportunity to all radiologists to participate.

The department has seen a 50% increase in geographical full time positions with 51 radiologists on tenure and promotion track, a 66% increase in publications and more than 4.5 million dollars in grant funding. New templates and information guides assist faculty members in documenting and promoting their academic activities.

We have one of the best radiology residency programs in Canada and undoubtedly in North America, with a 100% pass rate at the Royal College examination year after year. We have successfully passed 2 Royal College reviews over the past 10 years and we are the recipient of the 2017 Program Excellence Award – presented by PARO to the best residency program in Ontario. Our new Royal College accredited neuroradiology residency is attracting the highest caliber residents.

Our competitive fellowship program attracts candidates worldwide, and our radiologists are giving them an incomparable educational experience with a strong governance, mandatory academic day and new comprehensive evaluation format.

The Department of Radiology is also providing elective experience to a large number of undergraduate students at McMaster and beyond, and offers a successful visiting professor series.

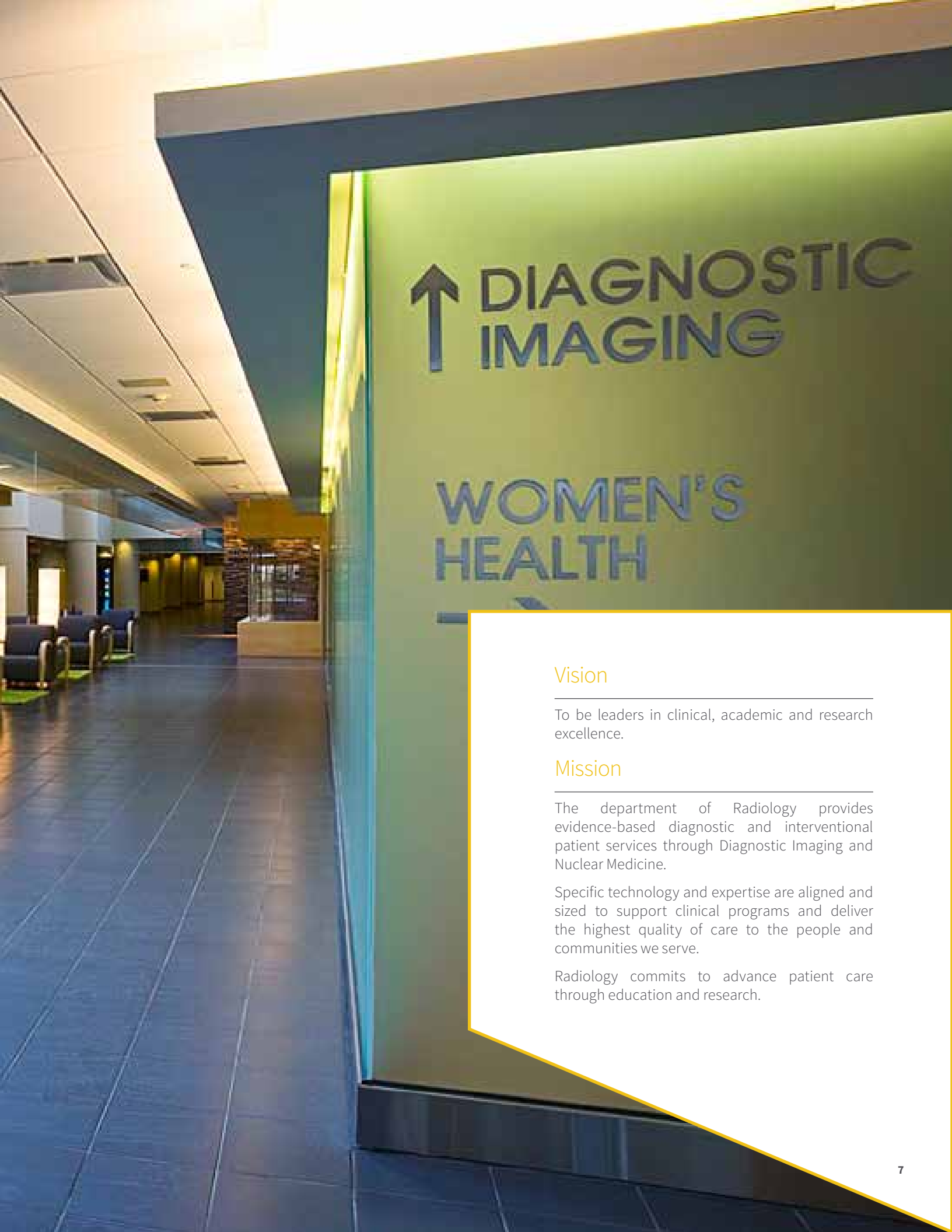
Our research has been growing with a number of radiologists involved in multiple projects, many with residents and fellows. We have created a research infrastructure with office space, a full time research manager and statistical support. Research collaboration is encouraged with other departments within the Faculty of Health Sciences, McMaster University as well as externally.

Our department is open to the world, with our residents completing electives in many countries, and our radiologists involved in international outreach activities.

Clinical excellence is a priority and the department is striving to raise the level of excellence through sub specialization and implementation of a new proactive peer review process to help radiologists identify areas for improvement.

It is a great honour and privilege for me to work with such dedicated colleagues who share the vision for academic excellence in radiology. These colleagues make our department what it is and they are our strength. This report is a tribute to their hard work.

Dr. David Koff, Department Chair



Vision

To be leaders in clinical, academic and research excellence.

Mission

The department of Radiology provides evidence-based diagnostic and interventional patient services through Diagnostic Imaging and Nuclear Medicine.

Specific technology and expertise are aligned and sized to support clinical programs and deliver the highest quality of care to the people and communities we serve.

Radiology commits to advance patient care through education and research.

Overview

The department of Radiology consists of faculty from a regional network of hospitals and facilities, and provides medical imaging education from undergraduate through to postgraduate to students from McMaster as well as to elective and fellows from beyond our walls.

INTRODUCTION

I am very pleased to introduce the Department of Radiology Five Year report, the second report of my tenure. Since our last report, we have stayed the course and continuously worked at raising the level of clinical and academic excellence, by engaging our radiologists and nuclear medicine physicians, promoting education and research, generating passion and enthusiasm. To achieve this transformation, we changed the recruitment model, and asked all our new physicians to be fellowship trained in subspecialty and join as full-time. Our department is younger, older radiologists have retired or changed their career profile to give way to highly skilled subspecialty colleagues and we almost completely achieved our subspecialty transformation. All this in a heavily constrained fiscal environment with shrinking budgets and little opportunity for growth.

OVERVIEW

The 96 faculty members of our department, 51 of them full time (compared to 34 five years ago), are primarily based at Hamilton Health Sciences and St Joseph's Healthcare Hamilton, and work in varied divisions: diagnostic and interventional imaging, nuclear medicine, obstetrics & gynecology, and medical physics. The 96 faculty members include also 18 adjunct members based in the Niagara Health Systems, Guelph and the Kitchener-Waterloo area.

Going back to the external review of the department performed in 2003, we have delivered on the recommendations issued by the reviewers in regards with the mandate of the leader:

- **A plan to consolidate the 4 practice plans, with an expectation that the plan be transparent and provide defined support to academic endeavors:** An Academic Practice Plan has been implemented and with contribution of all the members of the department, it allows us to support our academic leadership independently from the partnerships, allowing them to dedicate the time required to perform their tasks; it didn't require merging the practices, as the cultural differences between the different sites turned out to be too important for this to happen, but it provides with a new vehicle allowing for a decision mechanism independent from the groups and first step towards a financial

integration which could be achieved when radiology has again access to the Alternate Funding Plan.

- **The introduction of sub specialized divisions:** We have achieved subspecialization, at least at HHS, in all areas, following the concept of multispecialty radiology. This means that all our new radiologists are fellowship trained and practice at least 50% of their time in their area of subspecialty; the rest is spent in general radiology, in order for them to keep the basic skills required to function in a general environment. We have integrated subspecialty divisions in neuroradiology, body imaging, musculoskeletal imaging, breast imaging, pediatric imaging and vascular interventional.

- **The consolidation of clinical services, including on-call services:** Radiology has followed the Access to Best Care plan and the type of service provided at each site has been adjusted to the new plan. We have implemented a subspecialty call roster with an integrated interventional radiology call between all sites at HHS, a dedicated pediatric and pediatric neuroradiology call at MUMC, and a dedicated neuroradiology call at HGH.

- **The creation of a research team that should include PhD, staff radiologists and trainees with the objective to secure external support, and support multidisciplinary research:** IRC and MIIRC@M have been created to foster research within the department and reach out to external resources from other departments or faculty. With little funding from the Medical school, support from the Vice-President Research at the University and grant funding, we have developed successful collaboration with Clinical Epidemiology and Biostatistics, as well as Engineering at McMaster and University of Waterloo, among other partners to partner on a number of research projects which will be described in the body of this report.

The Hospitals have still to commit to a multi-year capital plan for Medical Imaging, and we have initiated discussions at HHS for such a system with a Managed Equipment Service, which still has to be acted upon.

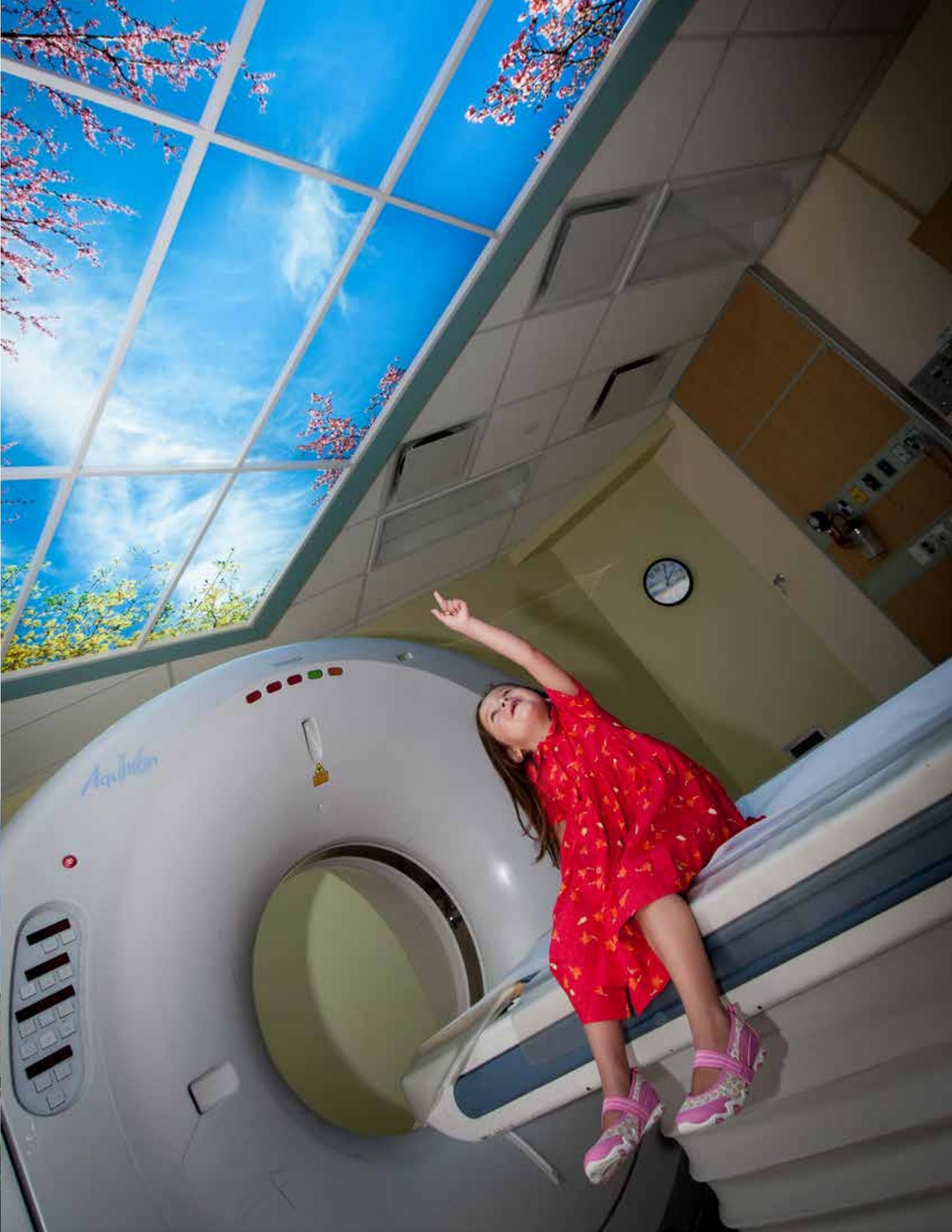
Thirteen years after the departmental review, we are at last moving towards an integrated PACS between HHS and SJH, which will streamline access to information between our two different hospital systems, especially useful for our cancer patients at the JHCC who are imaged at SJH. This will also foster multi-site collaboration in subspecialty, and facilitate multidisciplinary rounds as well as the implementation of a multisite prospective peer review system..

We had many other achievements that we can be proud of. Leveraging on the successful overhaul of our department, we can now see the results of a strong governance structure with a motivated leadership. We have a number of effective committees: Department of Radiology Academic Council (DRAC), Residency Committee, Fellowship Committee, Tenure & Promotion Committee, Continuing Education Committee, as well as a Subspecialty Committee and a new citywide Quality Committee. But one of our major accomplishments has been the creation of a joined position of Associate Chair Education and Departmental Education Coordinator (DEC) in charge with all aspects of education. The next position to be created will be Associate Chair Research. And we have a succession plan in place for the Chair position.

Our department is highly respected nationally and internationally, and it is very rewarding to have the privilege to present a significant list of achievements:

- Rejuvenated, one of the youngest department at McMaster through active recruitment;
- Achieving clinical excellence through subspecialization at all sites;
- Strong governance and succession planning;
- A mandatory academic practice plan in which all radiologists are enrolled;
- Leader in radiology education with one of the best residency program in Canada, again successful at obtaining Royal College accreditation with no weakness at last review;
- Internationally recognized for its excellence in postgraduate training, attracting fellows from all over the world;
- Open and accessible, with 50% of medical students performing an elective in radiology, and welcoming students from all Canada and residents from other specialties;
- An excellent visiting professor program;
- Leader in quality through a number of initiatives, including piloting the first prospective peer review system and promoting radiation safety through Canada Safe Imaging, a nationwide initiative;
- National and international initiatives;
- Excellence in research with the creation of a Research Manager position to support research initiatives within the department and collaboration with other departments;
- We are enduring an ongoing lack of funding which could result in deterioration of clinical services and inability to perform advanced research due to lack of state-of-the-art equipment;
- There may be a window of opportunity for the radiologists to join the Alternate Funding Plan, not to be missed;
- Ensure the financial sustainability of the program when sources of funding are reduced or more difficult to access;
- Quality is a priority and all radiologists must be enrolled in Peer Review, despite fear and resistance.

I thank you in advance for the consideration you will give to this report and hope that you will find this reading useful and inspirational.



ORGANIZATION & PHYSICAL STRUCTURE

Organization & Physical Structure

The Department Chair is ultimately responsible to the Dean/Vice President and provides leadership in all aspects of Department affairs.

ADMINISTRATIVE ORGANIZATION AND MANAGEMENT

The Department Chair is ultimately responsible to the Dean/Vice President and provides leadership in all aspects of Departmental affairs.

Our Governance structure is composed of a number of committees supporting the vision for the Department and managing our key activities. (see Chart below)

The Department of Radiology Academic Council (DRAC) assists the Chair in his responsibilities. The DRAC is composed of the Associate Chair Education and Department Education Coordinator (DEC), Research Coordinator, Residency, Fellowship and Undergraduate Program Directors (Chart 1). The site chiefs and chief of Nuclear Medicine are invited to the meetings, which take place every three months.

The DRAC is an advisory to the Chair of the Department of Radiology, in all matters pertaining to research, education and standards of radiology practice. It may also be asked to advise on other matters of importance to the department.

Chair / David Koff
DRAC
Associate Chair Education DEC / Karen Finlay
Undergraduate Program Director / Carmen Otero
Residency Program Director / David Landry
Fellowship Program Director / M. Chiavaras
Residency Research Coordinator / H. Takrouri

The Chair consults regularly with the DEC and Residency Program Director for matters pertaining to the daily academic operations.

Five (5) committees report to the DRAC: (see Chart below)

DRAC
T & P Committee
Residency Committee
APP Finance Committee
Research Committee
CME Committee

TENURE & PROMOTION COMMITTEE (T&P COMMITTEE)

The Departmental Tenure and Promotion Committee shall inform itself on the teaching abilities, scholarly achievements and University responsibilities of all candidates for re-appointment, tenure, permanence, and/or promotion.

The Departmental Committee will recommend to the Faculty T&P Committee for each eligible candidate that:

- tenure be granted, or
- no action be taken in regard to tenure, or
- the period of a tenure-track appointment be extended, or
- the candidate's tenure-track appointment be allowed to lapse, or
- promotion be granted, or
- no action be taken in regard to promotion.

As most members of our Department are self-funded, we don't have candidates on tenure track, but only eligible for promotion.

RESIDENCY PROGRAM COMMITTEE (RPC)

The RPC is responsible for the overall operations of the 5 year residency program. This includes the global objective of providing the environment, mentorship and uniform experience whereby each resident will have access to the educational experience sufficient to successfully complete the program objectives. The RPC committee is responsible for assisting and contributing to the program functions for the Diagnostic Radiology Residency at McMaster, including the following important domains:

- Training program design/curriculum
- Resident evaluation
- Appeals
- Recruitment
- Resident well-being
- Other Specific Resident Skills Development

ACADEMIC PRACTICE PLAN FINANCE COMMITTEE

An Academic Practice Plan has been created in the department to support the academic leaders independently from their groups. All radiologists belong to the Academic Practice Plan and contribute a tithe.

An annual membership fee is established democratically based on a budget developed by a Financial Management Committee (FMC) and approved by a two-thirds majority vote of the members. The purpose of the membership fee is to compensate members of the academic practice plan who provide educational leadership roles. The membership fee can be used for no other purpose other than the direct compensation of physicians.

The budget for physician compensation, and the corresponding per capita membership fee, is determined by the Financial Management Committee and approved by the members of the practice plan. The Financial Management Committee includes three appointed members and four elected members. The membership of the Financial Management Committee includes the Chair of the University Department of Radiology, Chief of Radiology St. Joseph's Healthcare Hamilton and Chief of Radiology Hamilton Health Sciences. Given the combined role of the HHS Chief of Radiology and Chair of the University Department of Radiology, the HHS Chief of Radiology will nominate a delegate to serve as a representative of the Hospital. This delegate shall be the Site Chief from the General, Juravinski, or MUMC site. The group of radiologists at each of the four acute care sites (General, Juravinski, MUMC, St. Joseph's) will elect one representative to sit as a voting member of the Financial Management Committee.

CONTINUING MEDICAL EDUCATION COMMITTEE (CMEC)

The mandate of the Continuing Medical Education Committee for the Department of Radiology will focus on the continuing professional development activities of members of the Department. Continuing Professional Development includes traditional clinical education as well as any educational activity that relates to an individual's professional role(s) and responsibilities (education, administration and research, personal developments, etc).

RESEARCH COMMITTEE (MRRC)

The McMaster Radiology Research Committee is composed of members who have demonstrated active research activities such as performing original research, having this work published in peer reviewed journals, actively pursuing [and in possession of] peer reviewed funding, and have participated in national or international grant review panels. In essence the MRRC should be made up of our most prolific researchers to maximize the quality of research output by the department. The committee has been temporarily suspended, mainly due to the elimination of our funding by the Hospital, but now that we have restructured our research organization in the Department, the committee will be reactivated.

Historically, the Department of Radiology was managed by the site chiefs at the 4 hospitals contributing to the academic department, with little coordination and collaboration between the sites. We have had to move away from this silo model and implement a new governance model supporting the evolution towards subspecialty and foster collaboration between the radiologists at all sites.

To facilitate this, we have created 6 Division Head positions, for each subspecialty. (see Chart # 3) The role of the Division Heads is summarized in their Terms of Reference and includes appropriate staffing and recruitment, standardization of procedures and protocols, quality assurance and quality control.

SUBSPECIALTY	DIVISION HEAD
Body Imaging	Dr. Tsai
Breast	Dr. Minuk
Musculoskeletal	Dr. Choudur
Neuroradiology	Dr. Mensinkai
Pediatrics	Dr. Stein
Interventional	Dr. Yip

The implementation of subspecialty divisions at Hamilton Health Sciences has generated significant results with an integrated Interventional Radiology program at HHS where radiologists have an integrated call roster.

Subspecialty coverage is now almost appropriately staffed at all sites thanks to the recruitment of fellowship trained radiologists over the past years. The subspecialty leadership is extending at all the sites, including St Joseph Hospital, and ensures a continuous subspecialty service to our patients. This requires engagement and collaboration of the leadership at SJH; such a collaborative

approach is required from their new Chief and has been included in the job description; this is a requirement in the selection process.

ADMINISTRATION:

The Program is supported by an Administrative Coordinator, Sue Gaudet, seconded by two administrative assistants: Marilynn Scott for the Undergraduate and Postgraduate programs and Cheney Matteliano for the Residency Program Director.

The department website is maintained by Jerome Marrin.

PHYSICAL STRUCTURE

Diagnostic Imaging at McMaster University is based out of Hamilton Health Sciences and St. Joseph's Healthcare Hamilton. There are three large teaching hospitals at Hamilton Health Sciences (HHS) including McMaster University Medical Centre, Hamilton General Hospital and the Juravinski Hospital and Cancer Centre.

As a large tertiary referral center for the Central West Region of Ontario and its population base of 2.3 million people, our facilities, programs and faculty members in Hamilton offer a comprehensive spectrum of health and disease expertise.

McMaster University Medical Centre (MUMC), which is located next to McMaster University in west Hamilton, has the nationally recognized McMaster Children's Hospital as well as Women's Health services, including high-risk Obstetrics and Gynecology. In addition, MUMC hosts one of Canada's most innovative Digestive Diseases programs.

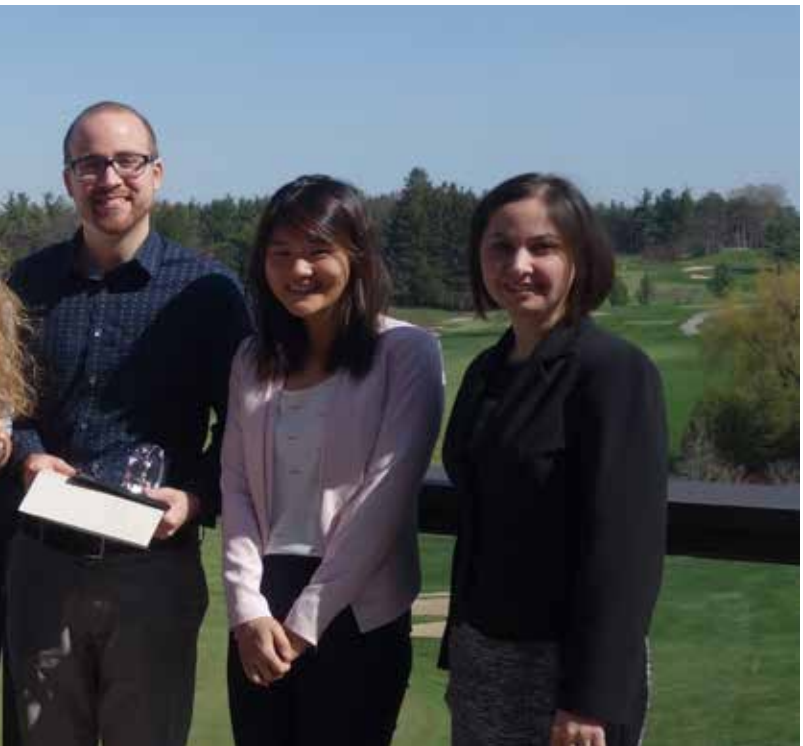
The centre has been redeveloped into a state-of-the-art facility to accommodate the growth of McMaster Children's Hospital, as well as to expand inpatient, outpatient and pediatric emergency services.

Our department of Diagnostic Imaging at MUMC services the above programs. We have 10 full-time radiology faculty, as well as several faculty members cross-appointed from Obstetrics and Gynecology. Fellowship trained faculty expertise focusses on pediatrics, including 3 radiologists trained in pediatric neuroradiology. The department houses a 1.5 T MR unit, 2 multi slice CTs, 2 active interventional suites, a large ultrasound department, as well as fluoroscopic and general imaging facilities. We are fully PACS integrated and work with voice recognition software. The department has close links with Pediatric and Adult clinical services. focusses on pediatrics,

including 3 radiologists trained in pediatric neuroradiology.

Juravinski Hospital, formerly known as the Henderson Hospital, is the region's center of excellence for cancer and orthopedic care. The hospital hosts the Juravinski Cancer Centre (JCC), the hepatobiliary program, a large Arthroplasty Program and general hospital services. The JCC represents the most comprehensive cancer care and research facility in the Central South/Central West region and is the second largest cancer centre in Ontario and fifth largest in North America.

Our department of Diagnostic Imaging at the Juravinski Hospital services the above programs. We have 18 full and part-time radiology faculty. It offers exciting imaging opportunities, within a recent department configuration and resources. We have a 3.0 T MR, 2 multi slice CTs, ultrasound, interventional and general imaging suites. Our faculty members have expertise and fellowship training in oncology/cross-sectional imaging, body imaging, musculoskeletal, neurology, interventional and breast imaging. We have a close working relationship with our clinical colleagues and offer teaching and training experiences for undergraduate medical students, residents and clinical fellows.



Hamilton General Hospital is recognized as a regional center of excellence in cardiovascular care, neurosciences, trauma and burn treatment. The hospital has one of the province's few Burn Units and is also home to an Integrated Stroke Unit for acute and rehabilitation patients. A number of redevelopment projects are underway, including a new Heart Investigation Unit, two new operating rooms, construction of the David Braley Cardiac Vascular & Stroke Research Institute, as well as the Regional Rehabilitation & Acquired Brain Injury Facility. With these exciting new developments, the Hamilton General Hospital will continue to grow and serve the community as a leading edge facility.

Our department of Diagnostic Imaging at HGH services the above programs and currently has 20 full and part time radiologists, with subspecialty expertise in neuroradiology, interventional, cardiac imaging, musculoskeletal, body and breast imaging. Our department has a very active trauma and Vascular/Interventional radiology program. This is all supported by two multislice CTs, two 1.5T MRIs, a full ultrasound department, and two interventional suites. We are fully PACS operational and utilize voice recognition dictation software.

West Lincoln Memorial Hospital (WLMH) has been providing exceptional care and service to over 65,000 residents of West Niagara since 1946. WLMH officially became a site of Hamilton Health Sciences in 2013 through amalgamation.

On average each year, staff and physicians at WLMH care for more than 25,000 individuals who visit the Emergency Department, 2,900 patients who are admitted to the hospital, and 1,000 babies and moms. In addition, WLMH performs over 3,700 surgeries, of which 80 per cent are on an outpatient basis.

WLMH is unique in its focus on integrating primary care. Local and family physicians comprise the medical staff working in the Emergency Department, operating rooms and throughout all areas of the hospital.

In partnership with McMaster University's Michael G. DeGroote School of Medicine located at Brock University, WLMH is also a teaching site for medical students in Niagara.

WLMH is a recent addition in the Hamilton Health Sciences family with its 60 beds, and hosts a small radiology department with general X-ray, ultrasound and breast imaging, one radiologist on site, and support from radiologists at HGH and JHCC.

St. Joseph's Healthcare Hamilton (SJHH) provides tertiary, secondary and ambulatory health care services. SJHH is home to the multi-million dollar Father Sean O'Sullivan Research Centre, the prestigious Firestone Institute for Respiratory Health and the high-tech Brain-Body Institute. It is recognized as the regional centre of excellence for kidney and urinary diseases, respiratory medicine and thoracic surgery, as well as head and neck surgery. The hospital's Department of Diagnostic Imaging has undergone major changes with expansion of its programs, services and equipment, as well as redevelopment of a brand new Diagnostic Imaging department in the hospital's new tower.

Our department of Diagnostic Imaging at St. Joseph's Healthcare Hamilton services the above programs. Our department assets include with state of the art imaging equipment and a bright, new radiology space. We recently installed a 3.0 T clinical MR unit, in addition to our existing 1.5 T unit. We also have 2 multi slice CTs, as well as state of the art interventional suites and ultrasound equipment. We have 16 faculty members, most with fellowship specialty training. Faculty fellowship training expertise includes Musculoskeletal, Body Imaging, Cross-sectional, Interventional, Chest and Breast Imaging. Imaging rotations at this site offer a great spectrum of interesting cases.

Combined with the Diagnostic Imaging department at St Joseph's Healthcare Hamilton (SJHH), there are over 1500 inpatient beds, as well as many active and varied outpatient programs. Among them, there are two busy Urgent Care Centres in West Hamilton and Stoney Creek.

Nuclear Medicine operates as an integrated service across the McMaster University Medical Centre/ McMaster Children's Hospital, Hamilton General Hospital, Juravinski Hospital and Cancer Centre sites of Hamilton Health Sciences and the Charlton Avenue Site of St. Joseph's Healthcare Hamilton.

Each facility provides a broad spectrum of nuclear medicine services with additional specialty capacity aligned to the hospital's clinical programs. Together, the laboratories offer a comprehensive spectrum of nuclear medicine services.

The lead sites for the subspecialty nuclear medicine diagnostic services and treatment are:

McMaster	BMD, 14C-Urea, Occupational Nuclear Medicine, Specialized Gastroenterology Testing, PET Myocardial Viability, Radioiodine Therapy
McMaster Children's	Pediatric Nuclear Medicine
Henderson/Juravinski	Oncology, Orthopedics, Infection Imaging, BMD
Hamilton General	Nuclear Cardiology

St. Joseph's	Nuclear Cardiology, Cardiac & Oncology PET/CT, Renal Studies, Radioiodine Therapy

We believe that alignment of diagnostic specialities and expertise with the clinical specialization of each site is extremely important in order to provide patient-centred care and effective and efficient support to referring clinical colleagues.

SATELLITE AND AFFILIATED SITES

During their residency, our students have to do a one month elective, that most of them perform in a community hospital, to be exposed to a different life experience and understand constraints and rewards of a community practice. The affiliated sites are: Cambridge, Guelph, St. Catharine's, Waterloo, Niagara Health and Norfolk and the radiologists at these sites hold adjunct positions in our Department.

A number of Independent Health Facilities (IHF) run and managed by the radiologists at all campuses provide teaching to our residents, broadening their field of expertise and exposing to an activity they don't see in hospitals. Knowing that 50% of imaging studies in Canada are performed in IHFs, this is an important addition to our program.

The office of the Chair is physically located in the Health Sciences Centre, McMaster University.

INTER DEPARTMENT COMMUNICATION

MONTHLY NEWSLETTER

The newsletter conveys on a regular basis information of interest pertaining to the Department of Radiology at Hamilton Health Sciences and St Joseph's Healthcare.

It starts with the Chair's editorial covering timely topics relevant to our activity and contains such information as the schedule of departmental activities and rounds, the upcoming major conferences and events, staff news, resident's corner and departmental announcements. There is a quality control and safety page, and major institutional announcements are also included. Faculty and staff are encouraged to participate in the newsletter in bringing their own success stories.

The goal was to create a common space where people could not only find relevant information but also communicate and share; this was meant to bring together a department where very different cultures co-existed for a long time and people didn't know each other.

WEBSITE

A well-documented website provides information on all the areas of the Department and has been recently updated with a new faculty directory. A database of all research projects past, as well as currently under way will be added soon.

The website can be viewed at:
http://www.fhs.mcmaster.ca/radiology/

ANNUAL ACADEMIC GET TOGETHER

The Chair has instituted an annual academic gathering where all faculty, residents and fellows are invited to attend. We plan the evening around a traditional cake (Galette des Rois). This event takes place the second week of January. During this informal evening the Chair, the DEC and the Program Directors give short presentations on their achievements from the past year and their goals and objectives for the year to come. This event is well attended, allows teachers and learners to share their views, and is designed to promote the academic mission.

E-MAIL COMMUNICATION

Special announcements are communicated to all relevant parties by e-mail on demand.

THE PEOPLE

The People

Please note that all of our faculty are Clinician Educators.

FACULTY

Through active recruitment to support subspecialization, the Department has grown from 78 members in 2011 to 99 in 2016. We went from 34 Full-Time to 51, with now 11 radiologists at the rank of Professor, from 2 in 2011. All radiologists who hold active medical staff appointments at St. Joseph's Healthcare Hamilton and Hamilton Health Sciences, and who hold either a full or part-time faculty appointment in the Department of Radiology at McMaster University are members of the Academic Radiology Practice Plan. Each radiologist pays the agreed-upon membership fee to academic Department of Radiology, which is used solely to pay stipends to physicians who hold specific educational leadership roles. The stipends are paid by McMaster University as employment income to the individual physician.

DEPARTMENT CHAIR

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Koff, David	2008	Professor	FT	Chest/Body	Yes

A. HAMILTON GENERAL HOSPITAL

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Birchenough, Brian	2008	Clin Assist	PT	Body, Neuro	Yes
Chiavaras, Meg	2010	Associate	FT	MSK	Yes
Choudur, Hema	2005	Associate	FT	MSK	Yes
Coblentz, Craig	1988	Professor	FT	Chest	Yes
Colapinto, Michael	2012	Clin Assist	PT	Cross-Sectional	Yes
Di Ianni, Michael	2012	Clin Assist	PT	Body, Breast	Yes
Doris, Ian	1988	Clin Assoc	PT	General, US	No

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Garces, Pat	2011	Assistant	PT	Body	Yes
Gastaldo, Fernando	2008	Associate	FT	VIR	Yes
Kennedy, Shauna	2014	Assistant	FT	Neuro	Yes
Landry, David	2008	Assistant	FT	General	No
Larrazabal, Ramiro	2005	Associate	FT	Neuro	Yes
Mensinkai, Arun	2010	Clin Assist	PT	Neuro	Yes
Moffatt, Ian	2015	Assistant	FT	Neuro	No
Patlas, Michael	2004	Professor	FT	Body, Breast	Yes
Ribeiro, Luciana	2011	Clin Assistant	PT	Neuro	Yes
Syed, Nida	2015	Assistant	FT	Body, Breast	Yes
Vu, Manh	2001	Clin Assistant	PT	General, MSK	No
Walker, Danielle	2016	Assistant	FT	Chest, Cardiac	Yes
Yip, Gordon	2002	Clin Assist	PT	VIR	Yes

B. JURAVINSKI HOSPITAL & CANCER CARE

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Dhamanaskar, Kavita	2005	Associate	FT	Body, Breast	Yes
Ferri, Melanie	2009	Clin Assist	PT	Cross-Sectional	Yes
Finlay, Karen	1999	Professor	FT	MSK	Yes
Golev, Dmitry	2014	Assistant	FT	MSK	Yes
Griffiths, Melanie	2005	Clin Assist	PT	General	No

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Jurriaans, Erik	1996	Professor	FT	MSK	Yes
Lee, Stephanie	2015	Assistant	FT	Body	Yes
Markose, George	2011	Associate	FT	VIR	Yes
Minuk, Terry	1984	Clin Assoc	PT	Breast	N/A
Nair, Sabarinath	2013	Assistant	FT	IVR	Yes
Otero, Carmen	2003	Associate	FT	Chest, Body	Yes
Parasu, Naveen	2007	Associate	FT	MSK	Yes
Stewart, Lori	2002	Clin Assist	PT	Body	Yes
Thomson, Andrea	2010	Clin Assist	PT	Body, Breast	Yes
Tsai, Scott	2008	Clin Assist	PT	Body	Yes
Wat, Josephine	2008	Clin Assist	PT	Body, PET	Yes
Yemen, Brian	1989	Associate	FT	Body, Neuro	No
Zakaria, Hoshang	2015	Assistant	FT	Body	Yes

C. MCMASTER CHILDREN'S HOSPITAL

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Ainsworth, Kelly	2013	Assistant	FT	Pediatrics	Yes
Alnassar, Mutaz	2012	Assistant	FT	Peds, Neuro	Yes
Maizlin, Zeev	2007	Associate	FT	MSK, Body	Yes
Martinez-Rios, Claudia	2016	Assistant	FT	Peds, Neuro	Yes
Mernagh, John	1996	Professor	FT	Body, US	Yes
Midia, Mehran	2003	Associate	FT	VIR, Neuro	Yes

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Singh, Nina	2004	Clin Assist	PT	Body	Yes
Stein, Nina	2011	Associate	FT	Pediatrics	Yes
Takrouri, Heba	2012	Assistant	FT	Pediatrics	Yes
Vora, Parag	2006	Associate	FT	VIR, GI	Yes
Wang, Yongdong	2012	Assistant	FT	Body, Peds	Yes

D. ST. JOSEPH'S HEALTHCARE HAMILTON

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Al-Douri, Faten	2016	Assistant	FT	Breast, Body	Yes
Athreya, Sriharsha	2008	Associate	FT	VIR	Yes
Boylan, Colm	2005	Associate	FT	Body	Yes
Coret, Alexander	2005	Associate	FT	Body	Yes
Coret-Simon, Judith	2005	Associate	FT	Neuro	Yes
El-khodary, Mohamed	2016	Assistant	FT	Body	Yes
Haider, Ehsan	2008	Clin Assist	PT	Body	Yes
Harish, Srinavasan	2006	Associate	FT	MSK	Yes
Kwok-Liu, Josephine	1981	Clin Assist	PT	Body, Breast	N/A
Leung, Vincent	2016	Assistant	FT	Breast	Yes
Muhn, Narry	2009	Clin Assist	PT	Women's Imaging	Yes
O'Neill, John	2003	Associate	FT	MSK	Yes
Rebello, Ryan	2006	Associate	FT	Body	Yes
So, Genhee	2008	Clin Assist	PT	Body, Interventional	Yes

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Stubbs, Euan	2015	Assistant	FT	MSK	N/A
Voss, Maurice	2003	Clin Assist	PT	VIR	Yes
Woods, David	1985	Clin Assist	PT	VIR	N/A

E. NUCLEAR MEDICINE

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Chirakal, Raman	1990	Professor	FT		
Farncombe, Troy	2004	Associate	FT		
Gulenchyn, Karen	2002	Clin Assoc	PT		
Jager, Pieter	2007	Professor	PT		
Marriott, Chris	2000	Clin Assist	PT		
Singnurkar, Amit	2009	Associate	FT		
Wong-Pack, William	2009	Clin Assist	PT		
Zukotynski, Katherine	2015	Associate	FT		

F. MEDICAL PHYSICS

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Farrell, Tom	1995	Professor	FT		
Hayward, Joseph	2003	Associate	FT		

G. RESEARCHERS

NAME	START YEAR	RANK	APT CATEGORY	SPECIALITY	FELLOWSHIP TRAINED
Frija, G	2014	Professor	PT		
Gordon, Chris	2000	Clin Assist	PT		
Tshibwabwa, Eli	2003	Associate	PT		

H. ADJUNCT MEMBERS

NAME	START YEAR	RANK	APT CATEGORY	CAMPUS
Abrams, Mitchell	2010	Adjunct	PT	Cambridge Memorial
Arvinte, Andre	2009	Adjunct	PT	St. Catharine's General
Cheng, Gordon	2009	Adjunct	PT	St. Catharine's General
Dobranowski, Julian	1979	Professor	FT	West Lincoln
Fienberg, Samantha	2012	Adjunct	PT	Grand River, Kitchener
Ghookal, Dharmendr	2009	Adjunct	PT	Waterloo
Knibutat, Darren	2014	Adjunct	PT	Grand River, Kitchener
Mehta, Amit	2011	Adjunct	PT	Niagara Health
Moosavi, Homayoon	2014	Adjunct	PT	Grand River, Kitchener
Patel, Samir	2011	Adjunct	PT	Guelph
Plaskos, Nick	2011	Adjunct	PT	Guelph
Popuri, Ramu	2010	Adjunct	PT	Cambridge
Raja, Fraisal	2012	Adjunct	PT	Brantford General
Venkatesh, Vic	2012	Adjunct	PT	Grand River, Kichener

NAME	START YEAR	RANK	APT CATEGORY	CAMPUS
Wallace, Eda	2014	Adjunct	PT	Grand River, Kitchener
Wu, Luis	2015	Adjunct	PT	Cambridge
Wycoco, Danny	2012	Adjunct	PT	Grand River, Kitchener
Yim, Annabella	2012	Adjunct	PT	Grand River, Kitchener
Yousef, Osama	2012	Adjunct	PT	Grand River, Kitchener

SUMMARY

	OTHER	HGH	JH&CC	MUMC	SJH	NUC MED	MED PHYSICS	RESEARCHERS	ADJUCT	TOTAL
FT	1	11	11	10	11	4	2		1	51
PT		9	7	1	6	4		3	18	48
	1	20	18	11	17	8	2	3	19	99

PROMOTION & TENURE

The Department of Radiology Tenure & Promotion committee shall inform itself on the teaching abilities, scholarly achievements and University responsibilities of all candidates for re-appointment, tenure, permanence, and/or promotion.

The committee will then put forth their recommendation to the Faculty of Health Sciences Tenure & Promotion Committee.

Below is a table listing the Faculty who have been promoted since 2012.

NAME	PROMOTION YEAR	PROMOTION RANK
Larrazabal, Ramiro	2012	Associate with CAWAR
Parasu, Naveen	2012	Associate with CAWAR
Farrell, Thomas	2012	Professor
Gastaldo, Fernando	2014	Associate with CAWAR
Singnurkar, Amit	2014	Associate with CAWAR
Mernagh, John	2014	Professor
Chiavaras, M Margaret	2015	Associate with CAWAR
Finlay, Karen	2015	Professor
Koff, David	2015	Professor
Patlas, Michael	2015	Professor
Markose, George	2016	Associate with CAWAR
Dobranowski, Julian	2016	Professor

AWARDS & HONOURS

NAME	YEAR	AWARD
S. Athreya	2013	Radiologist of the Year, McMaster University, Hamilton, Ontario
B. Bichenough	2013	Award in Best Radiology Resident Rotation (Neuroradiology at Hamilton General Hospital) at Department of Radiology, McMaster University
M. Chiavaras	2014	Radiologist of the Year, McMaster University, Hamilton Ontario
		Certificate of Merit, Educational Exhibit, Radiological Society of North America (RSNA), Chicago, IL, USA
		First Place Award, Educational Exhibit, International Skeletal Society 2014, Edinburgh, Scotland
	2013	First Place Award, Educational Exhibit,International Skeletal Society 2013 Philadelphia,PA,USA
		Silver Medal, Educational Exhibit,American Roentgen Ray Society Washington,DC,USA
	2012	Academic Leadership Program participant, McMaster University Nominated by Chairman of Radiology to participate in first annual, university-wide, multidisciplinary, longitudinal leadership course
		Magnum Cum Laude Award, Educational Exhibit, Radiological Society of NorthAmerica(RSNA), Chicago,IL,USA
		First Place Award, Educational Exhibit, International Skeletal Society 2012, Rome, Italy
M. Dilanni	2012	First Prize Poster Award – Radiology Research Day, McMaster University
J. Dobranowski	2014	First Prize in Radiology for his text book – Discover Radiology: Chest X-Ray Interpretation.
M. Ferri	2012	Best Academic Half Day Award – McMaster University Radiology
K. Finlay	2016	Certificate of Merit, Electronic Educational exhibit, ARRS Los Angeles, CA

NAME	YEAR	AWARD
	2013	Cum Laude Award. Educational Exhibit. RSNA, Chicago IL.
K. Finlay	2012	Program Director of the Year – Royal College of Physicians and Surgeons of Canada
D. Golev	2013	Outstanding Fellow of the Year - McMaster University, Hamilton, Ontario
S. Harish	2016	Award in Best Resident Rotation (MRI at SJHH) Dept. of Radiology, McMaster University, Hamilton, Ontario
		Fellow Teacher of the Year, Department of Radiology, McMaster University
	2015	Certificate of Merit, Educational Exhibit, American Roentgen Ray Society, Toronto
	2014	Excellence in Clinical Teaching Department of Radiology, McMaster University
		Award in Best Resident Rotation (CT at SJHH) Dept. of Radiology, McMaster University
		Best Radiology Half-Day Presentation, Dept. of Radiology, McMaster University
	2012	Best Scientific paper award, Society of Skeletal Radiology, Miami, Florida, USA
		Academic Radiologist of the Year – McMaster University, Hamilton Ontario
S. Kennedy	2016	Best Rounds Award – Department of Radiology, McMaster University
R. Larrazabal	2013	Award in Best Radiology Resident Rotation (Neuroradiology at Hamilton General Hospital) at Department of Radiology, McMaster University
C. Martinez Rios	2016	Caffey Award for best educational exhibit Society of Pediatric Radiology. IPR
		Award in excellence in education and research from Sick Kids Diagnostic Imaging Fellowship Program
A. Mensinkai	2016	Excellence in Clinical Teaching – Department of Radiology, McMaster University
	2013	Award in Best Radiology Resident Rotation (Neuroradiology at Hamilton General Hospital) at Department of Radiology, McMaster University
M. Midia	2015	Top Reviewer, American Journal of Roentgenology
T. Minuk	2014	Fellow Teacher of the Year, Department of Radiology, McMaster University
	2015	Fellow Teacher of the Year, Department of Radiology, McMaster University

NAME	YEAR	AWARD
M. Noseworthy	2013	Kowalski Prize, Journal of Chemometrics
N. Parasu	2015	Radiologist of the Year, McMaster University, Hamilton Ontario
M. Patlas	2015	Certificate of Merit, Radiological Society of North America
		Certificate of Appreciation, Radiological Society of North America
	2013	Certificate of Merit, Radiological Society of North America
R. Rebello	2015	Best resident rounds, Department of Radiology, McMaster University
	2013	Fellow Teacher of the Year, Department of Radiology, McMaster University
L. Ribeiro	2015	Award in Best Radiology ½ Day Presentation (Approach to Spinal Cord Imaging: Beyond Degenerative Disc Disease) at Department of Radiology, McMaster University
	2013	Award in Best Radiology Resident Rotation (Neuroradiology at Hamilton General Hospital) at Department of Radiology, McMaster University
		Award in Excellence in Clinical Teaching at Department of Radiology, McMaster University
S. Somers	2014	Fellow of the American College of Radiology (ACR)
	2014	Honorary Fellowship of the European Society of Gastrointestinal and Abdominal Radiologist (ESGAR)
N. Syed	2014	Second Prize for Fellow Research Project, McMaster University
S. Tsai	2016	Best Academic Half-Day Teaching–Department of Radiology, McMaster University
	2012	Fellow Teacher of the Year, Department of Radiology, McMaster University
H. Takrouri	2015	Quality assurance Award at McMaster university for the audit project: Image gently- Reduction of Radiation from Babygrams with appropriate selection of Image Field Size- A quality assurance initiative.
E. Tshibwabwa	2013	Outstanding Preceptorship in Pre-clerkship – McMaster University, Undergraduate Program

RECRUITMENTS & DEPARTURES

Our recruitment needs have been historically determined by the hospitals' clinical requirements. Our strategy has been to reorient our department in subspecialties and concentrate on recruiting only fellowship trained academic radiologists. Our recruitment follows the processes laid out by the University and Faculty of Health Sciences and Hamilton Health Sciences. All of our recruitments are joint university and hospital appointments. Candidates are interviewed by the hospital site chiefs, the appropriate division heads, the department DEC and the Chair and Chief of the department. Preferred candidates are brought in for a second round of interviews which include interviews with the relevant Faculty of Health Sciences representatives as well as additional colleagues.

Listed below is a table which outlines the faculty recruitment since 2012.

NAME	START YEAR	RANK	APT CATEGORY
Ainsworth, Kelly	2013	Assistant	FT
Al-douri, Faten	2016	Assistant	FT
Alnassar, Mutaz	2012	Assistant	FT
Colapinto, Michael	2012	Assistant	PT
Di Ianni, Michael	2012	Assistant	FT
El-khodary, Mohamad	2016	Assistant	FT
Frija, Guy	2014	Professor	PT
Golev, Dmitry	2014	Assistant	FT
Kennedy, Shauna	2015	Assistant	FT
Lee, Stephanie	2015	Assistant	FT
Leung, Vincent	2016	Assistant	FT
Martinez-Rios, Claudia	2016	Assistant	FT
Moffat, Ian	2015	Assistant	FT
Nair, Sabarinath	2013	Assistant	FT
Syed, Nida	2015	Assistant	FT
Takrouri, Heba	2012	Assistant	FT
Walker, Danielle	2016	Assistant	FT
Wang, Yongdong	2012	Assistant	FT
Zakaria, Hoshang	2015	Assistant	FT

Recruits are pending in musculoskeletal and cross-sectional at this time.

Listed below are the faculty departures since 2012.

NAME	START YEAR	RANK	APT CATEGORY
Ellins, Mary Lou (deceased)	1999	Assistant	PT
Franchetto, Arlene (retired)	1985	Associate	PT
Lee, Richard (resigned)	2005	Assistant	PT
Romeo, Michael (retired)	1982	Associate	PT
Chou, Sheila (resigned)	2002	Assistant	PT
Elder, Janice(resigned)	1999	Assistant	PT
Thomson, Graha (retired)	1987	Associate	PT
Franic, Slobodan (resigned)	1990	Associate	PT
Schiff, David (retired)	1982	Associate	PT

NAME	START YEAR	RANK	APT CATEGORY
Webber, Colin (deceased)	1975	Assistant	PT
Patterson, Mike (retired)	1990	Professor	FT
Wyman, Doug (retired)	1986	Associate	FT

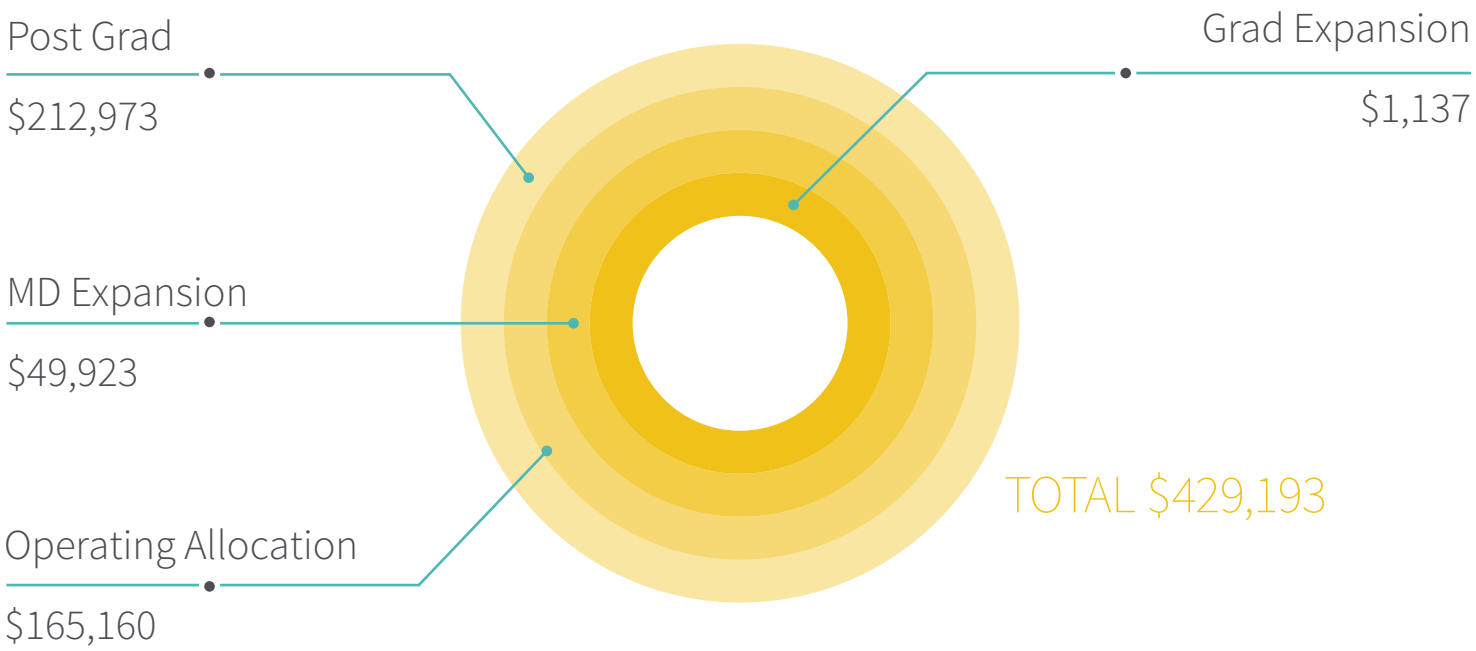
STAFF

The Department currently has one Administrative Coordinator and one Administrative Assistant, both of whom are UNIFOR members. They are both funded from operating funds.

DEPARTMENTAL FINANCIAL STRUCTURE

Departmental Financial Structure

The financial structure of the department focuses on the MTCU operating budget, externally funded account classified as specifically funded and research grants. The operating allocation has not been adjusted for several years.



The operating funds are used 80% for Faculty and support staff compensation and although there is pressing need for additional administrative support, the allocation would not support this expense. The total allocation remains the same as it was in 2011 which should be compared to other departments with similar staffing.

Strategic investments of the academic mission have included:

Research was supported through a transfer to Medical Imaging Informatics Research Centre at McMaster (MIIRC@M). These funds have been used to set up the research offices, obtain some staffing, and assist faculty with research endeavors. A Research Project Manager for the department has been funded through grants.

Financial support of the radiology fellowship program of $60,000 per year. This has been a very successful way to encourage the sites to participate at a higher level with the training of fellows. We have also successfully recruited some of these fellows due to the high caliber of training received from our own specialty trained radiologists.

We have opened an educational account using funds transferred from our departmental operating account. With the assistance of our departmental Continuing Medical Education Committee we look at using these funds to hold workshops and/or educational conferences for the purpose of educating our faculty as well as clinicians outside of our department. One such annual event is the Medical Imaging Informatics and Teleradiology Conference (MIIT), which addresses issues arising from the growing penetration of computers in medicine and the need to understand new technologies necessary to acquire, process, store and exchange medical images.

Our aim, by investing funds into these two ventures (research centre and educational fund), is to generate additional revenues for the department in order to be able to grow our research and educational programs.

EDUCATIONAL ACTIVITIES

Educational Activities

ASSOCIATE CHAIR EDUCATION

Report submitted by: Dr. K. Finlay

The Associate Chair Education role is designed to promote excellence in training, teaching and educational scholarship in the Department of Radiology at McMaster University. The Associate Chair Education works closely with the Department Chair, Residency Program Directors, Fellowship Program Director and Undergraduate Program Director in order to support departmental educational activities. A central component of the role is to assist the Chair in the tenure and promotion process. The Associate Chair serves as an advisor to the Department Chair, regarding relevant educational topics or initiatives. The Associate Chair Education also fulfills the university role of Department Education Coordinator (DEC).

COMMITTEE RESPONSIBILITIES:

The Associate Chair Education sits as member of a variety of departmental and university committees. This includes educational committees in the Department of Radiology: Department of Radiology Academic Committee (DRAC), Fellowship Committee, Tenure and Promotion Committee. In the capacity of DEC role, the Associate Chair Education also sits on the DEC Committee for McMaster Health Sciences, attending monthly meetings. This DEC group oversees a large educational mandate for faculty development, promotion and tenure, as well as comprehensive departmental educational activities. Many directives, educational initiatives and university groups consult and inform the DEC group. Active participation in this educational community assists with implementation of appropriate McMaster University policies, as well as awareness of trainee and faculty opportunities at the university. The university has developed CASCaDe (Continuing Academic and Scholarly Career Development) as a resource for faculty in Health Sciences. Faculty from the DEC group participate in an orientation evening for new faculty, on a rotating basis:

https://fhscascade.mcmaster.ca/

The Associate Chair has the opportunity for membership on additional Canadian and North American educational committees. This includes the Canadian Vice Chairs of Radiology. This meeting of Canadian Associate or Vice Chairs of Education in Radiology is organized at the ICRE (International Conference on Residency Education) or CAR (Canadian Association of Radiologists) conference. These national meetings serve as a forum for collaborative information sharing and networking between Canadian university faculty in similar roles. The ADVICER group (Alliance of Directors and Vice Chairs of Education in Radiology) is a North American group within the Alliance for Clinician Educators in Radiology (ACER), whose members have general oversight and executive managerial responsibility for all of the educational programs within their respective radiology departments. Attendance at ADVICER meetings at the annual AUR (Association of University Radiologists) meeting assists in gaining a broader perspective on educational opportunities and facilitates sharing of faculty development resources.

FACULTY DEVELOPMENT:

One of the primary roles of the Associate Chair Education is to oversee faculty educational activities and contributions. This includes active involvement at the time of full-time faculty recruitment, commencing with introductory meetings with each new faculty member. Central to the first meeting is orientation to the roles and responsibilities of full time faculty in our department, highlighting education and teaching, explaining the role of clinical scholarship and the clinician educator promotion track. The Associate Chair explains a number of roles available as educational opportunities for faculty and how these are tracked. A number of new templates and information guides have been developed to assist faculty members in documenting their activities and promoting their academic activities. These include:

- Guidelines for Faculty Tenure and Promotion, Diagnostic Radiology
- Standard Template: Teaching Portfolio, Diagnostic Radiology
- Standard Template: Clinical Portfolio, Diagnostic Radiology
- Revised template for yearly submission of educational activities for McMaster STAR system

These documents assist in accurately recording the educational, clinical and scholarly activities of our faculty, enhancing our profile within our department and at the university. The Associate Chair Education reviews these documents at the 3-year renewal or time of promotion of full time faculty, in order to advise the Chair, as well as inform the promotion and tenure committee. Documents reviewed include faculty CV's, Candidate Statements, Clinical and Teaching Portfolios. The Associate Chair is available to meet and advise any interested faculty member who wishes or requires more in depth consultation and advice regarding their activities, contributions and how to documents these. Part of the role as DEC involves completion of the Departmental Teaching Evaluation Report (DTER) for faculty at the time of their 3 year review, and at time of promotion.

A number of faculty recognition awards have been designed for our program, to recognize the educational contributions to residency and fellowship programs. These were developed by the former DEC and have continued as coveted awards in our department. We are also working towards additional enhanced methods for evaluating faculty contributions in teaching. These are important, particularly for faculty promotion and tenure. While there are standard on-line methods for evaluating rotation supervisors and half-day presentations, there are few additional methods developed for capturing daily read-out teaching sessions and hot-seat rounds. A new process for evaluating faculty teaching at resident "hot-seat" rounds has commenced, with a trial at the JHCC site, aiming to roll out city wide in the coming months. Further plans are in development for evaluating daily teaching practice. These established awards and new initiatives are important for recognizing the significant teaching contributions and quality of education in our department.

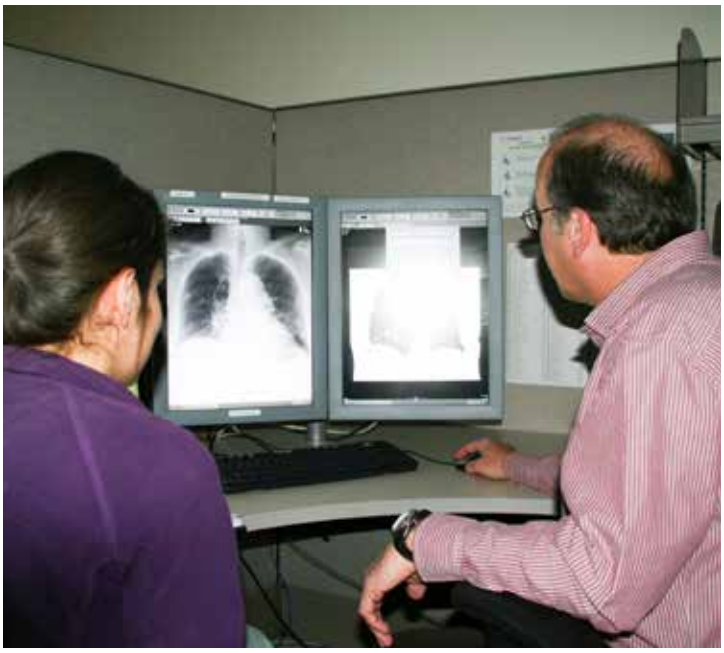
DEPARTMENT EDUCATION:

A key role for the Associate Chair Education is to advise and guide the educational leaders of our programs. This includes collaboration with the Diagnostic Radiology program director on any issues challenging the program and to assist with planning for the future. We are fortunate to have an excellent residency program in Diagnostic Radiology, under the guidance of our strong program director and contributions of many faculty members and support staff. All have contributed to the ongoing success of the residency, as recognized by the recent Royal College external review. As Associate Chair Education, specific new program initiatives supported include the resident audit projects and the highly successful annual residency program retreat. The Neuroradiology program at McMaster recently received "New Program" status with the Royal College for a 2-year accredited residency in Neuroradiology. The Associate Chair Education assisted our committed new program director with detailed document review, edits and advice regarding the new program application, as well as subsequent meetings to address any concerns arising from the first program internal review.

The Associate Chair Education also supports undergraduate medical education and radiology fellowship programs. The undergraduate program is overseen by the designated program director and supported by participating departmental faculty. A significant recent change in our undergraduate contributions includes enhanced teaching of anatomy to medical students with aid of ultrasound, developed collaboratively between radiology and faculty in Anatomy. Successful fellowship programs are operating

at each of our four Hamilton teaching hospital sites. The Associate Chair Education liaises with the fellowship program director to provide advice and guidance on relevant issues specific to fellowships. Advice and guidance is also available for any individual fellowship director or site supervisor regarding any issue of concern. With membership on various university and educational committees, the Associate Chair Education aims to share local and national information of relevance to assist with improving and enhancing our educational programs.

Lastly, the department has developed a working relationship with faculty from PERD (Program for Educational Research and Development), in order to build on educational initiatives and scholarly educational work within our department. As a faculty member interested in educational initiatives, the Associate Chair Education works collaboratively with faculty from PERD to build on opportunities for residents and faculty. An assessment committee is in development, designed to enhance effective assessment and evaluation in radiology, with overall goals of evaluating current methods of practice, developing new tools and changing the culture of assessment in our department. This will assist with the transition to Competency By Design (CBD) being introduced by the Royal College, as well as incorporation of CanMEDS milestones for radiology. This collaborative work with PERD and interested faculty will assist with preparing our educational programs for the future.



UNDERGRADUATE EDUCATION

Report submitted by: Dr. C. Otero

Prior to February 2011 there was no Undergraduate Program Director in the Department of Radiology.

The director is now included in all planning and debriefing meetings for all Medical Foundations as the UGME Radiology Longitudinal Planner. In 2015 the director attended all planning and debriefing meetings for Medical Foundations 2, 4 and 5. This allowed updating the department's participation in some of the MF, in particular, including new speakers for large group sessions and updating and coordinating Radiologists participation in Clinicopathology Conferences for MF 5 and MF 4 and MF 3.

Quarterly meetings occur with DR. R. Whyte, Assistant Dean, and Dr. Koff to discuss and evaluate the departmental contributions to UGME.

Regular meetings with Dr. Karen McAssey take place to discuss pre-Clerkship and Clerkship curricular needs and there is now an established liaison with Regional Campuses assistant Deans.

Dr. Otero has been coordinating with Dr. J. Dobranowski the future relocation of CORA lab to the Anatomy Department. This has involved meetings with Dr. Dobranowski and Dr. Wainman and visits CORA at St. Joe's and to the new location at MUMC Anatomy lab. Dr. Otero has also worked on promoting medical tutorship liaising radiologists with Jane Bennett (Curriculum Coordinator).

2016 brings many exciting challenges. One that has been highlighted with high importance by Dr. Whyte is the development of Departmental Objectives for Clerkship and pre-clerkship which will be included in the curriculum and in Medportal.

POSTGRADUATE MEDICAL EDUCATION

Residency

Report submitted by: Dr D. Landry

The residency program in Diagnostic Radiology at McMaster University is a 5 year training program. Our residents spend their first Post Graduate Year (PGY) in basic clinical training, followed by four years of training in diagnostic radiology in all the required areas. Elective time is built in to the program design in the senior PGY 4 and PGY 5 years. Five institutions participate in our program: Juravinski Hospital and Cancer Centre; Hamilton General Hospital, McMaster University Medical Centre and St. Joseph's Healthcare Hamilton. Residents also spend 3 months at the Hospital for Sick Children in Toronto, under an affiliation agreement with the University of Toronto.

The program has gained recognition as a strong, competitive Canadian training program. There is an established track record of graduating well-trained residents, success at certification examinations and recruitment of McMaster graduates to top-notch fellowship programs. Graduates have been successful in obtaining permanent positions in the community, as well as teaching hospital environments. The current residents and program graduates express a strong level of satisfaction with their residency training. They acknowledge the tremendous volume and variety of cases they are exposed to in the Hamilton environment, as well as the highly supportive faculty. The residents value the close, collegial relationship between staff and residents, as well as the excellent teaching they receive.

ADMINISTRATION/ORGANIZATION/STRUCTURE

PROGRAM DIRECTOR:

The current program director has been in this position since July 2012. A day of protected administrative time is supported by Hamilton radiologists via the Radiology Academic Practice Plan and the Chair's office. The program director receives administrative support for the program, in the form of a designated Program Assistant, currently Cheney Matteliano.

RESIDENCY PROGRAM COMMITTEE:

The Residency Program Committee has representatives from all 4 teaching sites, as well as a Resident Research Coordinator. There are 4 residents on the committee, including 2 Chief Residents and 2 elected resident representatives. The committee meets approximately 6-8 times per year and actively oversees all the activities of the program. The committee is successful at addressing and seeking solutions to current issues in the program. Resident

feedback indicates they are comfortable that their concerns are taken seriously and that their input and suggestions are given strong consideration.

RESIDENT RECRUITMENT:

There are currently 32 residents in the program: 6 - PGY 1, 6 - PGY 2, 6 – PGY 3, 7 – PGY 4, 7 – PGY 5. Residents are recruited to our program predominately through the national CaRMS match. For the last few years, McMaster has been designated 5 positions for Canadian Medical Graduates (CMG) and 1 position for an International Medical Graduate (IMG). The program has successfully recruited highly ranked resident candidates. Allocation of resident positions is reevaluated yearly by the Postgraduate office based on available Ministry of Health funding. We have on occasion accepted externally funded Gulf State residents when strong candidates have come to our attention.

CURRICULUM:

The first basic clinical training year consists of rotations in general surgery, internal medicine, emergency medicine, neurology, obstetrics and gynecology, pediatrics, orthopedic surgery, general pathology, radiation oncology and anatomy/ultrasound. The PGY 2-5 years are structured to rotate residents through all the subspecialty areas, as outlined in Royal College requirements. The case load and facilities at McMaster are sufficient to provide the required rotations outlined by the Royal College, supplemented by a dedicated 3-month pediatric radiology rotation at the Hospital for Sick Children in Toronto. There is increasing responsibility for interpretation and independence with imaging and procedures. Residents are able to take on increasing complex cases as they rotate through the usual rotation design.

In PGY 4, our residents have the opportunity to attend a 4 week dedicated radiologic pathology course in Washington (AIRP). Although this is not mandatory, all residents usually attend, as this is an outstanding educational experience. The program assists in off-setting costs for this course.

There is a comprehensive physics course provided to all residents. This internal course occurs twice in the year: one-week block in late August; one-week block in May. The course and lectures are organized and delivered by basic science faculty in radiology at McMaster University. Each resident attends the course during their PGY 2-5 year. This course is highly valued.

A well-organized half-day program is delivered on Wednesday afternoons. The Chief Residents assist the program director in organizing the speakers and topics. The usual format is a didactic or case-based presentation by faculty in the first half of the afternoon, followed by interesting case session for residents in the second half. Additional material presented during the half-day includes the resident journal club (approximately 6-7 per year) as well as CanMEDS presentations.

RESIDENT EDUCATIONAL SUPPORT:

Our residents receive financial support for a number of educational activities. This includes tuition sponsorship for attendance at the 4-week radiologic pathology correlation course in Washington D.C. There are educational stipends of $1500.00 per year provided to each resident in their PGY 4 and PGY 5 year. These stipends assist in paying for books, educational material or review course tuition in the senior years. The PGY 4 residents are also all sponsored to attend a 3-day advanced CT imaging course at the University of Toronto.

The program has built and continually contributes to a dedicated resident library, housed at the MUMC site. The program maintains subscriptions for a robust and comprehensive on-line educational tool (StatDx / Rad Primer) and imaging anatomy atlas (e-anatomy). All residents have access to these on-line educational resources.

RESIDENT RESEARCH:

The program provides financial support for residents who present at meetings. This includes up to $1000.00 for a poster presentation or educational exhibit and up to $1500.00 for a podium presentation. Many residents have been successful with abstract submissions to a variety of national and international radiology meetings and have utilized this program support.

Residents are required to complete one formal research project during their residency program. This project must be presented at our Annual Radiology Research Day. There is steady participation in the research process. Several recent residents have successful obtained RMA scholarships and PSI awards. Our Resident Research Coordinator meets regularly with the resident group to review progress on research projects, organize journal clubs and to facilitate lectures with Jane Castelli and Sandra Monteiro on basic concepts in research methodology.

Commencing in 2013, our residents are required to undertake a clinical audit project in addition to their formal research project requirements. These projects have been targeted to our junior residents and have provided a stimulus for many exciting projects. Our anticipation is that all projects will be presented at our Annual Resident Retreat and submitted to the Canadian Association of Radiologists (CAR) Annual meeting audit competition.

EDUCATION, TEACHING AND LEADERSHIP:

Resident participation in undergraduate medical education is structured into the program, with each of the PGY 3 residents formally participating in Medical Foundations 2 and 3. This involves small group sessions in the anatomy lab, reviewing anatomy with aid of ultrasound under the supervision of Dr. Dmitry Golev (JCC radiologist). The residents are evaluated on their teaching skills. These sessions are well-received by the medical students. Several residents also contribute to the undergraduate program through their presentations at the Radiology Interest Group and as clinical skills preceptors.

Residents are actively involved in organizing and presenting at the Summer Radiology On-Call Lecture Series. As well, residents are formally assigned throughout the year to case presentation responsibilities at half-day. They also present at the resident Journal Club and for CanMEDs topics. These presentations are formally evaluated, with individual feedback provided to each resident.

Resident leadership in our program is demonstrated through committee work. Each year a member of the Basic Clinical Training committee usually comes from our program. Residents have opportunities to serve as an elected representative on our training committee. Our residents have also sought to be involved with national (CAR) and international (RSNA, ARRS, AUR) radiology organizations.

EXTERNAL REVIEW

In 2015, the program underwent an on-site survey by the Royal College of Physicians and Surgeons of Canada, as part of the regular cycle of external review of Postgraduate Medical Educations programs at McMaster University.

The program received FULL APPROVAL. We were appreciative of comments provided by the survey team and will endeavor to incorporate them into our regular curriculum renewal.

UPDATES TO THE RESIDENCY PROGRAM

New program initiatives have been developed over the last few years. These include the following:

RESIDENT CANMEDS RETREAT:

A CanMEDS / Research retreat was developed in 2012 to provide an opportunity to review non-Medical Expert roles for the resident group. This was very well received by our resident group and has been made into an annual event.

Our lectures have covered a broad range of topics from McMaster radiologists, regional and national organizations.

Past Meeting Agendas:

2012	Evidence Based Medicine, Anatomy of a Good Teacher, Clinical Teaching: Method, Tips and Tricks for Residents, Feedback / Learning Styles
2013	Practical Statistics for Medicine, Screening Group Exercise, Collaboration, Clinical Audits
2015	Peer Review, Adverse Events (CMPA), Professionalism (CPSO), Royal College Review Process
2016	Leadership, Sample size to REB, Provincial Issues in Radiology (OAR), Errors in Radiology

With continued growth of this exciting educational event, we have created a leadership position to oversee planning of CanMEDS retreat. Dr. Stefanie Lee will bring her expertise to planning future events.

CLINICAL AUDIT PROJECT:

Clinical audits represent a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria, and the implementation of change.

The purpose of this activity is to:

- Verify standards of achievement
- Highlight areas of good practice
- Identify areas requiring improvement

The Royal College of Physicians and Surgeons of Canada training standards mandate a need to educate residents on this important activity. This is referenced in the B4 standard applying to CanMEDS Role of Leader: *"The program **must** be able to demonstrate that it provides opportunities for all residents to learn the principles and practice of quality assurance."*

Under the leaderships of Dr. Karen Finlay and Dr. Naveen Parasu, we have initiated a clinical audit project requirement for all residents. We have had three cohorts complete an audit project with a wide variety of projects with good faculty engagement. Residents have presented their audit projects at annual resident retreat and are encouraged to submit their projects to CAR SM audit competition.

CHALLENGES

EVALUATION:

Facilitating consistent face-to-face evaluation in the context of an electronic web-based evaluation system is challenging. This is further complicated in the setting of program design with short one-block rotations, where residents work with a number of different faculty teachers (due to the nature of department schedules).

We have engaged an evaluations committee to assist with trying to improve upon the feedback provided to our resident group as well as faculty. The goal of the committee is to assess current evaluation format, develop new evaluation tools, implement new evaluation strategy, trial period and modification based on feedback from residents and radiologists.

INCREASING DEMANDS FOR IMAGING:

With ongoing pressure for 24/7 access to all imaging modalities, our residents are challenged with volume. This is particularly relevant for the residents in the after-hours work environment. There is an increasing demand for final staff interpretations. Moving forward it will be important to ensure that residents are provided with the opportunity for interpretation and decision-making skills, as an important element of their education process, rather than having this all quickly referred to staff.

COMPETENCY BASED EDUCATION PROGRAM EXPANSION:

Royal College has begun transitioning resident education from CanMEDS framework to Competency Based Medical Education (CBME). CBME, an outcomes based approach to medical education, will shift from time based approach to milestone based curriculum. The roll out of this program will be a prolonged process for Royal College as each program will be required to convert their training from CanMEDS to CBME. Diagnostic Radiology is slated for Cohort 6. Depending on current RC progress, DI Specialty Committee will begin working with Royal College to prepare discipline in 2019 with DI residents entering CBD-based program in 2021.

Neuroradiology Residency Program

Report submitted by: Dr. Ramiro Larrazabal

The McMaster University Neuroradiology program is designed to produce strong clinical neuroradiologists. The program fosters the development of neuroradiology skills as well as strong consultative skills. As a program, we strive to produce neuroradiologists who will be life-long learners, able to respond to the increasing demands of our exciting, rapidly expanding medical subspecialty. The program is designed to meet the specifications of the Royal College of Physicians and Surgeons of Canada, as well as address comprehensive CanMEDS roles.

On completion of the educational program the graduate physician will be competent to function as a consultant in Neuroradiology. Communication skills, knowledge, and technical skills are the three pillars on which a neuroradiological career is built.

The program provides two core years of training in diagnostic neuroradiology. On successful completion, the physician shall have the necessary skills to maintain a consulting practice in general diagnostic neuroradiology.

This program follows closely the guidelines of our radiology residency program with regards to organizational structure, evaluations and assessments and work closely with the postgraduate office to ensure that we are following the guidelines of the University as well.

FELLOWSHIP

Report submitted by: Dr M. Chiavaras

PROGRAM BACKGROUND

The McMaster University Radiology Fellowship Program is one of the largest in Canada offering postgraduate training across four sites at Hamilton, Ontario, Canada. This is a comprehensive educational experience that attracts Fellowship applicants from North America and abroad.

With access to more than a thousand inpatient beds, the affiliated hospitals of McMaster University form one of the largest teaching facilities in North America. The available resources combined with excellent medical staff and modern technology provides an ideal setting for physicians interested in advanced training in Radiology. The goal of the various Fellowship Programs is to provide advanced clinical and academic training in a variety of different subspecialties and modalities. All fellowship programs have both clinical and compulsory academic components. Most fellowships are focused on a particular subspecialty.

PROGRAM DIRECTOR:

The Program is administered by the Fellowship Program Director, who reports to the Chair of Radiology and the Assistant Dean of Postgraduate Medical Education.

FELLOWSHIP PROGRAM COMMITTEE:

The Fellowship Program Director chairs the Fellowship Program Committee, which consists of the Chair Dr. Koff, Associate Chair Education Dr. Karen Finlay, and city-wide Fellowship Program Co-ordinators.

There has been a standardization of Fellowship Program guidelines across the city. Together with the Fellowship Program Committee, policies and procedures of the fellowship programs were standardized across all radiology fellowship programs.

PROGRAM CHANGES

- **Musculoskeletal radiology**. A second musculoskeletal fellowship program, the Trauma and Sports Imaging Musculoskeletal Fellowship, was started at the Hamilton General Hospital beginning with the 2015-2016 academic year.

- **Neuroradiology**. The 1-year Neuroradiology Fellowship at the HGH is no longer being offered. This has been replaced by the new Royal College accredited 2-year Neuroradiology (PGY 6/7) residency program.

EVALUATION PROCESS

- The Program Committee discussed the One45 evaluation process and importance of providing written and oral feedback regarding clinical, research, and educational components of the program.

- We will continue to review the existing evaluations, timelines, distribution, and pooling fellow evaluations with resident evaluations.

Research

- The research requirements for the McMaster University fellows were reviewed and a more formalized approach was instituted with all fellows submitting preliminary abstracts in the Fall of each year.

Meetings

- Radiology Fellowship Program Committee meetings take place twice a year.
- McMaster Postgraduate Fellowship Committee meetings take place twice a year.

Events

- Annual Academic Radiology Get-together: takes place in January at the Hamilton Club
- Fellows Welcome dinner: takes place in September at the Hamilton Club
- Resident/Fellow graduation: Awards for Fellow of the Year and Fellow Teacher of the Year were given

Website

- The Radiology Fellowship website was reviewed and changes were implemented to reflect changes in the Fellowship Programs.

CONTINUING EDUCATION ACTIVITIES

Visiting Professor Program

Report submitted by: Dr. Sat Somers

This program is coordinated by Dr. Sat Somers. It began in its present form while Dr. Somers was the Chair of Radiology and was originally a joint program with the University of Toronto Department of Radiology. Dr. Somers invited all the speakers for both sites and the costs were shared. The University of Toronto dropped out of the joint arrangement when a new Chair was appointed there. The program continues at McMaster University in the original format.

We have between seven and nine speakers a year, seven being scheduled between October and May usually during the first full week of each month. Each visiting professor gives three lectures which are presented on a Tuesday evening from 6:00 to 7:00 pm, and on Wednesday at 7.30 am and 12 noon. Between the two Wednesday lectures, the speaker shows board type cases to the residents. Each visiting professor is an expert in their field and speakers are chosen so that most areas of radiology are covered each year. If a topic is in the news, we try to get a speaker in that area.

The last lecture of the academic year is the Dr. W Peter Cockshott Memorial Lecture. Dr. Cockshott was the founding Chair of Radiology at McMaster University. The visiting professor for this lecture is always a musculo-skeletal radiologist, as Dr. Cockshott had a special interest in this area.

In addition to the scheduled program, expert speakers passing through our area are recruited to give lectures. This saves us some of the costs as we do not have to pay transportation expenses.

The speakers are asked to send us about four to six potential topics and we choose three of them. The choice is made by consensus. Local radiologists who have an interest in the field, and the residents, are asked to submit three choices from the list supplied. The topics favoured by the majority are chosen to be presented. The speakers then send us the educational objectives for the chosen topics.

Every lecture is web cast and archived for a year. Anyone with a PC can watch and listen to the lectures live or from the archives. If you are at an institution that has sophisticated web casting facilities, you can also participate in the question period.

Royal College accredited CME credits can be claimed by either filling out an evaluation form at the lecture or on line. To prevent fraud, a passcode protected webcast is provided and allows one to claim the credit on line.

The major difficulty with this program is cost. The speakers receive travel expenses, accommodation, and meals while in Hamilton, as well as an honorarium. On the Tuesday evening, to encourage net-working, residents and radiologists who have a common interest with the speaker, are invited out to dinner with the speaker. This allows discussion in a quieter environment.

The visiting professor program is particularly popular with the residents. They get to “rub shoulders” with experts whom they may not have been able to otherwise meet. It is also a very important recruitment tool to get the best candidates for the residency program.

The cost of the visiting professor program is shared by the Chair’s operating account and a grant from GE Healthcare. GE Healthcare has an educational grants program that is separate from their sales division, and is not linked to any purchases from General Electric. Dr. Somers applies for a grant each year. The grants used to be up to $25,000 per year. Now the maximum is $5000 per year. We have been fortunate in obtaining the maximum grant since they reduced the amount given.

The program is supported by Marilynn Scott and Kim Harper. Marilynn is based in the Chair’s office. Kim is based at St Joseph’s Hospital. Kim is the departmental administrative assistant and takes care of booking the rooms at St Joseph’s. St Joseph’s hospital is used as the site for the lectures because of the support given by Kim Harper as well that site having the best audio visual support. Marilynn ensures that the flyers are written and printed for each speaker, their accommodation arranged, restaurant bookings made, and reimbursement arranged for the speakers’ expenses. These two people provide excellent support and the program would not function as well without them.

Pediatric Visiting Professor Program

Report submitted by: Dr. Nina Stein

In addition to the Visiting Professor program, Dr. Nina Stein established the Radiology Pediatric Visiting Professor program at McMaster's Children Hospital approximately 5 years ago. Distinguished pediatric fellowship trained radiologists are invited twice a year to attend the McMaster Children's Hospital to lecture and meet with our radiology residents and invited Department of Pediatric physicians and residents. The lectures are held in the spring and fall of each year and are coordinated with our resident's half-day sessions.

Our Visiting Professors come from renowned pediatric centres in Ontario such as CHEO (Children's Hospital of Eastern Ontario) in Ottawa, The Hospital for Sick Children (Toronto) and University of Toronto.

The two lectures are held on a Wednesday morning; at 8:00 am and 12 noon. Hot seat cases are held between the two lectures with our radiology residents.

Dr. Stein communicates with a number of speakers whom are experts in their particular field, and offers them a few pertinent topics on which to lecture, along with available dates. Once the date and topics are agreed upon, the speaker sends the associated objectives for each lecture.

The lectures are available via web cast and archived for a year. Anyone unable to attend in person can watch and listen on their pc or laptop Live or from the Archives.

Evaluation forms for each lecture are available for attendees to complete to claim Royal College Accredited CME credits. The radiology residents complete electronic One45 evaluations as it pertains to their half-day session. The visiting lecturer receives a certificate denoting their CME credits for their lectures and educational time.

Since the lecturers are from Ontario, cost is kept to a minimum. The majority of time, no accommodations, transportation or limo service is required; nor stipend. The lecturers are provided with meals and out of pocket expense. This program is in-kind and an excellent opportunity for academics to share their expertise.

The program is supported by Marilynn Scott, administrative assistant from the Chair's office. Marilynn is the liaison between Dr. Stein and the lecturer to ensure the flyers are prepared and distributed, order catering, book conference rooms and audio-visual support, schedule videoconference/webcast, record attendance and CME evaluations, and make travel arrangements and prepare reimbursements, as required.

ADDITIONAL TEACHING INITIATIVES

RESIDENT INTERNATIONAL ELECTIVE PROGRAM

Dr. W. Peter Cockshott was one of the founders of the Faculty of Health Sciences at McMaster University as well as a Professor of Radiology and the founding Chair of the radiology department from 1967 to 1977. He played key roles in the design of the McMaster

Health Sciences Centre and in curriculum planning. To honour Dr. Cockshott McMaster University established a memorial fund to promote radiology education.

Through this Peter Cockshott Memorial fund we are able to financially assist our residents in participating in international electives each year.

In 2013, two of our residents went to Hamburg, Germany to participate in an elective.

In 2014, two residents went to Rio de Janeiros, Brazil, 2015 saw two residents going to Barcelona, Spain and in 2016 we had two doing electives in Sevilla, Spain.

This has been a very successful program that is well received by the residents. The two residents selected each year are required to present to the rest of the residents and share their experiences.

One of the residents, Dr. David Doucette-Preville travelled to Hamburg and had this to say about his experience,

> *"During the final month of our fourth year of residency, we were very fortunate to receive funding from the Peter Cockshott fund which allowed us to travel to Hamburg for a four week international elective. We spent this time at an academic hospital, the Asklepios Klinik St. Georg, which offers a wide range of services, but specializes in trauma, cardiology/cardiac surgery and spinal surgery. We chose Hamburg in large part because of a local contact, a previous resident in our program. This was a phenomenal experience both from a learner's perspective and from a cultural standpoint. We spent time in various areas of the department with residents and staff and were exposed to their large complement of Siemens equipment. We also took advantage of our time there to explore Hamburg and other European cities"*

Cancer Imaging Program

Report submitted by: Dr. Julian Dobranowski

In 2009, Cancer Care Ontario (CCO) initiated the Cancer Imaging Program, which joined nine other clinical programs within CCO. Dr. Julian Dobranowski was selected as the inaugural provincial lead of the Cancer Imaging Program. The initial focus of the program was to establish a dialogue with stakeholders and to work collaboratively with them to identify areas and opportunities for quality improvement in cancer imaging.

Through this dialogue four high-level areas of priority emerged, as follows:

1. Developing and Fostering an Imaging Community of Practice
2. Imaging Appropriateness: To move towards ensuring that Ontario's cancer patients receive the right imaging test at the right time
3. Timely Access to Imaging: To support and ensure timely, equitable access to quality imaging across the province.

4. Improving Communication: To ensure key radiology report information is communicated to the appropriate experts, such as the referring physician to facilitate timely clinical decision-making and promote a consistent approach to the interpretation of diagnostic and prognostic factors.

Radiological reports in the historical context constitute the primary means of communication between radiologists and referring physicians. In the year 2016 the communication extends to various other stakeholders. Cancer staging radiological reports can be communicated to up to 16 different stakeholders including the patient, the family doctor, pathologist, oncologist, surgeon, radiation oncologists and other radiologists.

The value of radiology depends not only on the image produced, but also on the contribution of that report to patient management decisions and clinical outcomes. The majority of radiological reports are still acquired in free-text format using speech recognition. Recent studies show that frequently clinically important information is lacking in the radiology reports. This information is essential to improve outcomes and to enhance patient care.

The opportunity to improve quality through better reporting and communication by the use of synoptic radiology reports led to the addition of “Synoptic Radiology Reporting” as a programme priority. The initiative is leveraging the knowledge gained from the development and implementation of provincial synoptic reporting for pathology, as well as the development of a synoptic report for pre-surgical staging of rectal cancer with MRI, a collaborative initiative between Cancer Care Ontario and Canadian Cancer Society.

To provide expert, interdisciplinary guidance regarding clinical content standards, the Synoptic Radiology Reporting Clinical Advisory Panel was established in 2013 at CCO. This panel determined the need for the creation of a document that would be used by disease-site and/or modality-specific expert subcommittees to guide the creation of cancer imaging synoptic reports. Two white papers were developed. One is on the architecture of the synoptic report. This document provides recommendations on the minimum mandatory key elements for a cancer imaging radiologic report – containing key information required for decision support, specific to cancer but broadly applicable across disease-sites. The second document is on governance.

Work is ongoing on the creation of the following synoptic reports:

- CT lung cancer staging synoptic report
- Solitary pulmonary nodule synoptic report to be used during the High Risk Lung Cancer Screening Pilot Project

In 2015 the CCO Cancer Imaging Program held the first ever Synoptic Reporting Conference in Toronto

MSK Outreach Program

Report submitted by: Dr. Hema Choudur

McMaster International Initiative in Asia: During the years 2012-2016, Dr. Hema Choudur, Division of MSK Imaging has initiated and developed Outreach work in Asia. This includes educational and scientific support as well as an International advisory role to various musculoskeletal societies in Asia including India, China and the Middle East.

Dr. Choudur has helped with the formation and inaugural meeting of the Musculoskeletal Society of India in 2013. This society functions under the guidance of an eminent teacher and educator Professor Dr. Kakarla Subba Rao FRCR, FACR who is the current President of the society. Since its inception, Dr. Choudur has assisted this society with their annual scientific conferences in the capacity of an International advisor. She also works closely with the organizing committee of the MSK Ultrasound Society of India to spread the knowledge of ultrasound MSK imaging amongst the young upcoming radiologists in the rural and urban areas. She has interacted with students and staff of Radiology departments across several Indian Universities and corporate hospitals, as guest faculty and educator. She has helped the local radiologists organize workshops in various parts of India to spread the knowledge of MSK imaging among local students and faculty and provide accessible care at various levels.

Through live online lectures with University of Peking, China and with the aid of mobile apps for quick dissemination of knowledge, she interacts and shares her experience with MSK radiologists across Asia. Working with local MSK bodies in various parts of the Middle East, China and India through the Asian MSK society and International Skeletal Society, in the capacity of motivated teaching faculty, she has spread the message of the McMaster International Initiative of “accessible and state of the art global health care”. She is working with the Radiology faculty in various universities to conduct multicenter trials in MSK Imaging to help inculcate the spirit of global research. Currently, she is working on two multicenter research projects with various universities in Asia “ INORMUS” and “SUCTION” – the first to develop a large database to identify the problems related to fracture imaging with a long term view of finding solutions to these problems based on local resources; the second to develop research skills and collaboration in the area of ultrasound guided treatment of calcific tendinosis of the rotator cuff.

Her main aim is to establish an outreach body in the Radiology Department at McMaster University to facilitate interaction of MSK radiologists and Radiology students in Canada and Asia. This year, for the annual MSK Radiology conference in Ahmedabad, India, she is organizing a session-“ Canada Presents” with Canadian Musculoskeletal Radiology faculty from Universities of British Columbia and McGill.

The overall goal of this outreach work is to facilitate a global perspective to musculoskeletal problems and help with providing accessible MSK imaging/interventions to the global citizen with limited locally available resources under the banner of McMaster International Initiative. With the initial experience in the developing countries in Asia, she along with fellow faculty across Canada hope to spread the program to Africa and other underdeveloped countries. Any interaction is a two way stream- through the outreach program, we at McMaster University learn how to facilitate global health in a setting of limited resources. At an individual level, we obtain an overview of how things function in a global milieu, learn to share and respect various perspectives in culture, education and research! Most of all we learn to appreciate our own health care systems and realize the urgency of sharing our experience and knowledge with the rest of the world.

Ultrasound Teaching - Kenya

Report submitted by: Sue Kras

“May the blessings be” this is the Swahili meaning of the word Baraka. I have witnessed first hand the many blessings that have been bestowed upon the people of Narok South District in Kenya.

On October eleventh I left my comfortable home in Dundas and travelled half way across the world to Kenya to be a part of the “Free the Children” Me to We” organizations.

The generous donation of two Antares Ultrasound machines by Hamilton Health Sciences and Dr. Koff to the Baraka and Kishon Clinics required a technologist to train their Health Care workers and I was the lucky candidate.

It was such an honour to work with Clinicians and Nurses who are dedicated to improving the health and quality of life for community members, especially women and children.

The main concept that Free the Children provides is a means to empower communities to break the cycle of poverty. By providing fresh water, education, health care, alternative incomes and livelihood programs a village can learn how to sustain itself.

“Me to We” encourages the motto “Offering a hand-up, not a hand-out”. By living by this motto I feel like I am the one who benefitted the most by this experience. By showing the clinicians the capabilities of an Ultrasound unit and the incredible asset it will be in assessing their patients, especially the “Mammas” the enthusiasm they showed was overwhelming. I got to be the direct recipient of their gratitude, something I would like to share with you all. The people in our department donated money, clothes, soccer balls, water bottles and toys to make my trip even more worthwhile. Please know how grateful and humble all of the people were with your generosity.

The breathtaking scenery, incredible wildlife and graciousness of the people of Kenya are something I will sorely miss and I look forward to going back.

EDUCATIONAL REPORT

We have included the teaching contributions comparison reports in our appendices.

RESEARCH ACTIVITIES

Research Activities

Understanding what is meant by the term “Research” within the context of Radiology and Nuclear Medicine will help to understand the complexity of promoting research in our field. Generally, research endeavors fall into one of the following categories:

SUPPORTIVE RESEARCH

The techniques of Diagnostic Imaging are frequently used as part of a research project generated from outside of Diagnostic Imaging. Examples would include bone scanning in clinical trials originating from the Juravinski Cancer Centre, MRI imaging in the assessment of a putative treatment for osteoarthritis or chest X-rays required for cardiology research. Within Diagnostic Imaging the relevance and significance of such work depends entirely on the extent of the academic involvement of faculty and staff. Supportive research is not particularly significant if the involvement is merely the provision of regular service activities to a research program. However the provision of regular service activities to a research program where Radiology faculty and staff are intimately involved in the design, overview, analysis and dissemination of the research is an important research activity.

DEVELOPMENTAL RESEARCH

The extensive dependence upon technology in Diagnostic Imaging means that much effort must be expended on developing, improving and optimizing equipment and imaging protocols as well as evaluating new image processing procedures. This includes for example, the examination of different pulse sequences in MRI, the development of new radiopharmaceuticals in Nuclear Medicine and the optimum establishment of image analysis and reporting systems. This type of activity might be considered development rather than research.

CONTRACT RESEARCH

A significant research activity is the use of radiological and nuclear medicine techniques to answer questions originating from external organizations such as pharmaceutical companies. Generally this requires the following of a strict protocol originating from the external partner. This form of research is generated as a result of either special skills, expertise or techniques available in Diagnostic Imaging or because of access to specific, defined groups of patients.

ACADEMIC RESEARCH

The academic activity more widely accepted as “Research” outside of Radiology includes the processes of the conception of an original idea, the formation of an investigational plan, the acquisition of grant funds to support the investigation and the advancement of knowledge by the dissemination of findings to the community. An important component of this activity is the intimate involvement of students.

Participation in activities such as those outlined above enhances the workplace environment for technologists, staff and faculty. High quality research raises the profile of Departments and of Hamilton Health Sciences within the local, national and international communities. The raised profile in turn improves the quality and quantity of recruits available at all levels. An intimate, synergistic relationship should exist between patient service and research activities. A high level of patient service will raise questions that need to be addressed using well designed research protocols to provide evidence based answers. An active research program enhances the standard of service provided by the Department.

WHY IS IT DIFFICULT FOR RADIOLOGY TO PROMOTE RESEARCH?

It has been suggested that since Radiology is a service specialty, it tends to follow that radiologists, as a group, are accustomed to answering questions rather than raising questions to be answered. While it is true that Radiology and Nuclear Medicine both exist to answer diagnostic dilemmas, involvement in such challenges should be a fertile arena for the generation of research questions.

Currently Departments of Radiology and Nuclear Medicine are forced to operate such that Faculty barely have sufficient time to meet clinical service needs without undertaking the additional burden of a research program. A vicious circle has been imposed whereby time available has been diminished to the extent that no time is available for research activities. As research activities decline further and further, recruitment becomes more of a challenge since young radiologists and nuclear medicine physicians must work at institutions where they have a chance to generate publications for the benefit of their future careers.

Radiology Departments are often accused of lacking a research culture. This is almost an inevitable consequence of a burdensome clinical load. The limited time available means that academic activities are restricted to descriptive research rather than hypothesis driven research. The former cannot generate support from external funding agencies. Hypothesis driven research requires a critical mass of interested individuals collaborating as a team to address issues raised during the provision of service to the patients of HHS.

Radiology staff are often considered to be either “clinicians” or “researchers” with minimal interaction between each category. The former would be numerous, hold medical degrees and generate revenue. The latter would be few, hold a doctoral degree and cost the Department money. Of course there are some truths and some misconceptions in these oversimplifications. Nevertheless the dichotomy between service and research severely limits research activities. A Diagnostic Imaging research program is only successful if it is focused on solving problems which originate from and are identified through service activities.

Cognizant of these limitations, and part of our recruitment pattern of Full Time academic radiologists, more and more of our radiologists have made the choice to work 3 or 4 clinical days, in order to have protected time for academic endeavors including research.

RESEARCH STRUCTURE IN THE DEPARTMENT

There are three major poles of research in the Department, which are in fact the structures where PhD’s are available to write grant applications, and have time to dedicate to research. The three are IRC, MIIRC@M, and Nuclear Medicine and we have included below a brief outline of each.

A major step forward for our Department has been the ability to recruit a Research Manager to interface with clinical departments and support and organize research.

Nuclear Medicine & Molecular Imaging
Imaging Research Centre (IRC) at St. Joseph's Healthcare Hamilton

Report submitted by: Dr. Karen Gulenchyn

Dr. Karen Gulenchyn, the Chief of Nuclear Medicine was appointed the Medical and Scientific Director of the IRC in November 2013 and in September2015 the Nuclear Medicine Manager, Ms. Carol Dunne, assumed responsibility for management of the IRC. This report spans activities in both Nuclear Medicine and the IRC. It is our firm belief that research promotes excellence in the provision of clinical care.

PROGRAM CAPACITY

The program operates in 5 laboratories across 3 Hamilton Health Sciences facilities (MUMC, HGH, and JHCC) and St. Joseph's Healthcare Hamilton, Charlton Campus (Nuclear Medicine and IRC) offering imaging services, Bone Mineral Density, non-imaging radionuclide investigations and radionuclide therapy. This very complete and diverse program provides not only excellent service to our patients, but also provides a substantial resource for investigative studies and a rich clinical opportunity for our learners. The IRC incorporates a modern 3T MRI unit dedicated to research studies and an older 16-slice PET/CT unit that is used for both clinical and research studies.

Over the past 5 years we have introduced new techniques, initially as investigative protocols, later translated to clinical services:

- Myocardial perfusion imaging with Rubidium-82, including imaging-based FFR determination,
- Radionuclide therapy with Radium-223 for castrate resistant prostate cancer with bone metastases, and
- FDG PET/CT imaging for new clinical indications; Head & Neck Cancer Staging & evaluation of unknown primary, Staging of Lymphoma, Esophageal Cancer Staging.

FACULTY APPOINTMENTS AND NOTABLE ACHIEVEMENTS

Dr. Philip Joseph, MD FRCP(C) [Cardiology] was recruited to the Division of Cardiology and the PHRI with a cross appointment to Nuclear Medicine in January 2014 following completion of fellowship training in Nuclear Cardiac Imaging, initially in Hamilton and subsequently in Boston.

Dr. Christopher Marriott was recognized for his teaching expertise by receipt of both McMaster's Excellence in Clinical Teaching Award, and the Radiology Department's Best Teaching on a Rotation Award, in 2012.

Dr. Amit Singnurkar completed a MPH, Clinical Effectiveness, at Harvard School of Public Health, in August 2015. Dr. Singnurkar currently serves as a member of the Ontario PET Steering Committee.

Dr. Katherine Zukotynski MD FRCPC (Radiology, Nuclear Medicine) was recruited in July 2015, joining us as Associate Professor, Medicine & Radiology. Dr. Zukotynski serves many roles within the Society of Nuclear Medicine and Molecular Imaging (SNMMI), most notably as Treasurer & Secretary of the SNMMI, President of the Eastern Great Lakes Chapter of the SNMMI and Vice President of the

PET Centre of Excellence of the SNMMI. In 2016, Dr. Zukotynski was awarded the SNMMI Ursula Mary Kocemba-Slosky, PhD, Professional Relations Fellowship and named Chair of the Nuclear Medicine section of the American Roentgen Ray Society (ARRS) Instructional Courses.

Drs. Karen Gulenchyn, Amit Singnurkar, Katherine Zukotynski, and Christopher Marriott are Principal Investigators in the IRC, in addition to their clinical roles. Dr. Mike Noseworthy, IRC investigator, is cross appointed to both Nuclear Medicine and Radiology, with a primary appointment in Electrical and Computer Engineering. Dr. Troy Farncombe, Nuclear Medicine and IRC investigator carries a primary appointment in Radiology with cross appointments to the School of Biomedical Engineering and Medical Physics.

STAFF

Through support provided by the Research Departments of Hamilton Health Sciences and St. Joseph's Healthcare Hamilton, and the Associate Dean, Research, Faculty of Health Science, Nuclear Medicine was able to employ a Research Co-Ordinator from 2011 to 2015. The two individuals who filled this position played an important role in training staff in each of our facilities to properly conduct and support research projects in all of our facilities. Currently, the IRC Charge Technologists (Janet Crouch -PET/CT and Janet Burr – MR), the Senior Scientist (Norm Konyer), and Nuclear Medicine Nurse (MaryLou Lawlor) share the responsibilities for the conduct and monitoring of clinical trials in Nuclear Medicine and the IRC, with nominated part-time research technologists in each laboratory outside the IRC.

It is the goal of our program to have all technical, medical, nursing and research staff trained in Good Clinical Practice (GCP) such that we can support clinical research by obtaining the highest quality of data.

STUDIES

The following section describes the studies performed during the time period January 1, 2011 to June 30, 2016. Some studies were initiated prior to January 1, 2011 but either completed enrollment during the time period in question, or are on-going. Subject numbers reflect either actual or planned enrollment depending on study status.

A total of 95 studies were in-progress or initiated, 76 using MR technology, 19 using Nuclear Medicine technologies and 2 using both. A total of 8660 subjects have been studied or are planned for study. Table 1 shows the distribution of studies and study

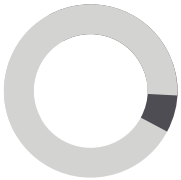
OF MR TECHNOLOGY STUDIES

76

OF NUCLEAR MEDICINE STUDIES

19

OF STUDIES USING BOTH



2

Total Number of Subjects

A total of 8660 subjects have been studied or are planned for study.

subjects by technology utilized.

		# OF STUDIES	SUBJECTS ACTUAL OR PLANNED
Both MR & Nuclear Medicine		2	40
	fMRI	36	1558
MR	MRI	31	2127
	Device	7	N/A
	PET/CT	10	3437
	SPECT or SPECT/CT	5	1252
Nuclear Medicine	Planar	1	2
	Molecular Breast Imaging	2	194

Of the 95 studies, 7 were industry sponsored; of the remainder the majority (91) were initiated by McMaster investigators, but studies also originated from other centres, University of Toronto (3), University of Ottawa Heart Institute (2), and one each from Ryerson, the University of Waterloo, York University, and the British Columbia Cancer Centre. Studies came from a wide variety of hospital and university programs, including Psychology and Psychiatry, Kinesiology, Rheumatology, Linguistics, Surgery, Oncology, Population Health Research Institute, and Nuclear Medicine, among others. The close collaboration of the Centre for Probe Development and Commercialization (CPDC), and the School of Biomedical Engineering at McMaster University has been a key factor in the development of this research.

RESEARCH, GRANTS, AND SUPPORT

From January 2011 to June 2016, collectively our Nuclear Medicine faculty have attracted over 2 million dollars in grant funding. We have reviewed hundreds of grants and abstracts through the American Heart Association (AHA), the Radiologic Society of North America (RSNA), Prostate Cancer Canada (PCC), the Canadian Institute for Health Research (CIHR) and the SNMMI, among others. Our faculty sit on numerous steering/advisory committees including the Medical Imaging Trial Network of Canada (MITNeC), Rb-ARMI, and the Sylvia Fedoruk Canadian Centre for Nuclear Innovation Inc., to name a few.

PUBLICATIONS, PRESENTATIONS, LEADERSHIP, AND OUTREACH

Our Nuclear Medicine investigators have published 40 peer reviewed articles or book chapters, 18 as first or senior author, and 2 books. There have been a total of 33 peer-reviewed presentations or poster presentations. Our faculty have been involved with the development of guidelines through Cancer Care Ontario (CCO) and appropriate use criteria through the SNMMI. We have been invited to give over 20 lectures across North America and we have organized CME accredited conferences and workshops both in Canada and the United States. Further, we have been involved in several outreach programs both through the SNMMI and locally through the prostate cancer support group based out of Dundas, Ontario and the Grimsby Medical Professionals Group.

IRC MR investigators have published an additional 47 peer reviewed articles, 24 as first or senior author and 2 book chapters. They have completed 76 peer-reviewed or oral presentations or poster presentations.

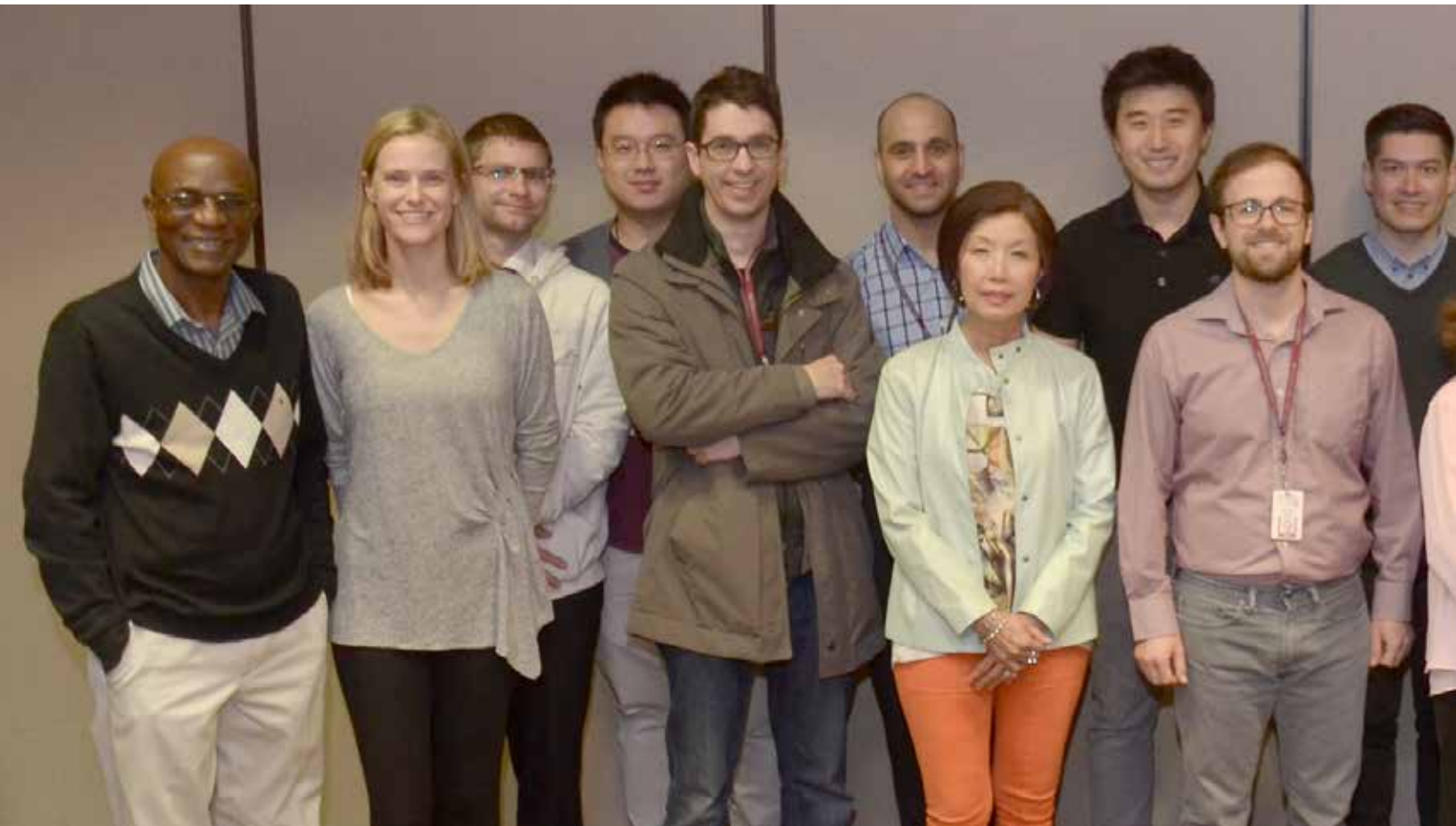
TRAINING OF HIGHLY QUALIFIED PERSONNEL

Nuclear Medicine provides rotations to all Radiology and Cardiology residents. The program has been expanded to include exposure to PET/CT technology. Faculty provide didactic sessions in both academic programs. Endocrinology and Radiation Therapy residents also undertake short rotations to gain experience in radionuclide therapy.

Drs. Farncombe and Noseworthy supervise MSc and PhD candidates from the School of Biomedical Engineering, and Electrical and Computer Engineering. Nuclear Medicine and IRC facilities are available to support the work of the students.

CONCLUSIONS

Over the past 5 years the major focus of the Nuclear Medicine Department and the IRC has been clinical imaging research. The development of a Research Fellowship would further augment this program. The recruitment of at least one additional clinician-investigator in the near term will be necessary to sustain this program. Finally, there is an urgent need to add an additional up-to-date PET/CT scanner to ensure that we can continue to operate both clinical and research programs.

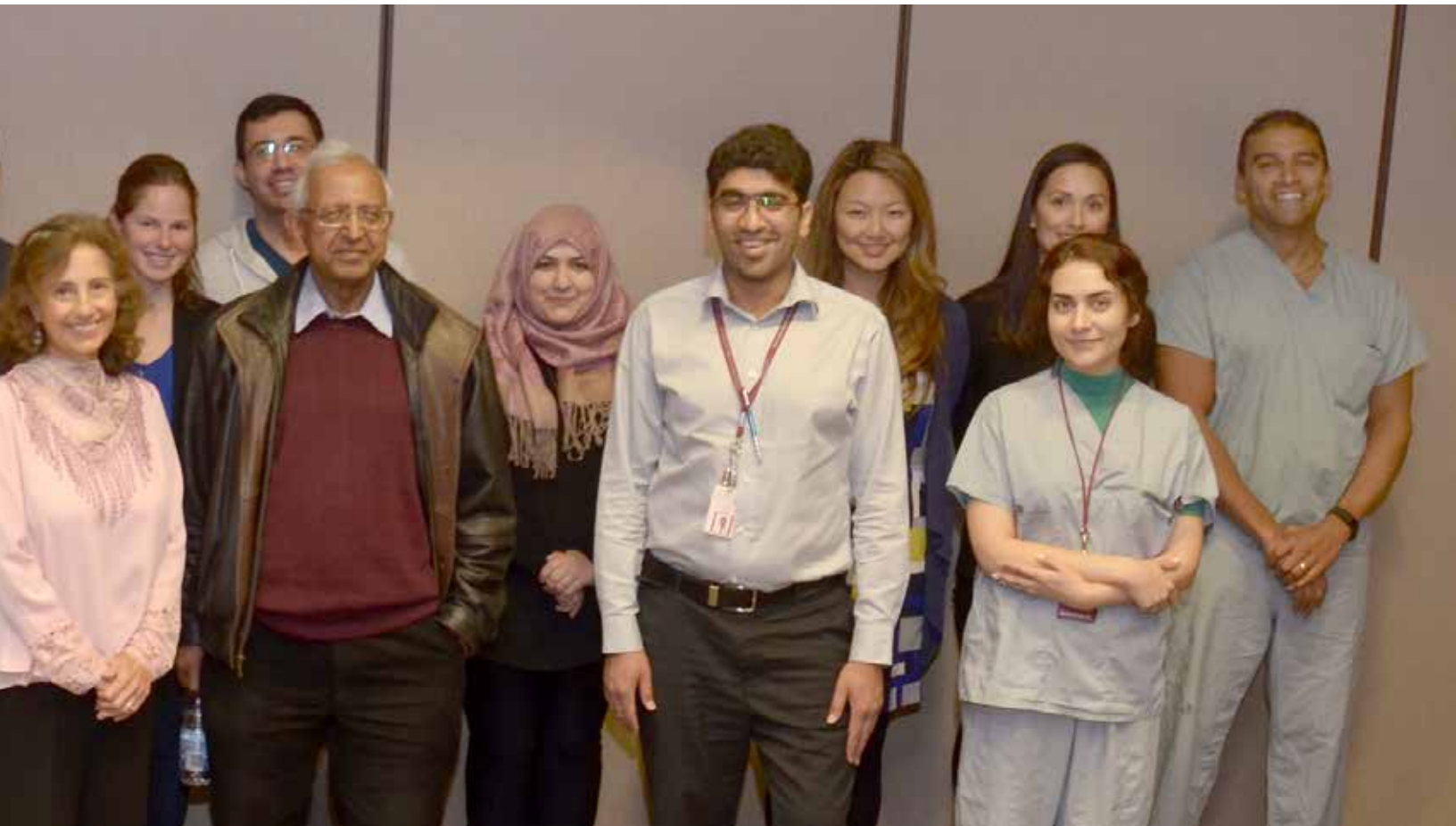


Biomedical Optics Program

Report submitted by:
Drs. Tom Farrell and Joe Hayward

Tom Farrell and Joe Hayward collaborate in this research area and currently supervise or co-supervise 4 graduate students (2 PhD, 2 MSc) within the Department of Medical Physics. Work is funded by NSERC with colleagues in Engineering Physics and the Hamilton Health Science Foundation with colleagues in the Department of Medical Physics.

The primary focus of the work is the development of new hardware and software to bring optical spectroscopy and fluorescence instruments into an operating room to measure tissue optical properties in situ. At present this work is directed towards better delineation of tumor margins for glioblastomas and for breast tumors. Together with colleagues from surgery and pathology this work is progressing from initial trials using ex vivo samples to the ultimate goal of a portable OR ready device.



The McMaster Preclinical Imaging Facility

Report submitted by: Dr. Troy Farncombe

The McMaster Preclinical Imaging Facility (MPIF) is a core facility located at MUMC dedicated to performing imaging studies in small animals. It has been in operation since 2006 and is operated by Rod Rhem, (Research Technologist), under the Direction of Troy Farncombe (Associate Professor of Radiology). The Facility is utilized by a consortium of users, representing investigators who contribute a minimum of $5,000 at the start of the fiscal year, thereby guaranteeing access to the Facility along with a specific number of imaging hours, at a greatly reduced cost. Access to the imaging equipment is also provided to non-consortium members at an hourly rate. Imaging equipment consists of:

- Philips MOSAIC PET – 12x12x12 cm field of view, capable of 2 mm spatial resolution
- Gamma Medica X-SPECT – 15x15x15 cm field of view, 1 mm spatial resolution
- Gamma Medica X-CT – capable of up to 0.075 mm spatial resolution.

The Facility is located at MUMC with convenient access to the McMaster Central Animal Facility. The PET, SPECT and CT imaging equipment available is very similar to the same imaging equipment used clinically, but with much higher spatial resolution (~1 mm for the SPECT, ~2 mm for the PET and ~0.075 mm for the CT). Over the years, the Facility has performed a large number of research studies for a variety of both academic and industrial users. The types of studies performed ranged from gastric emptying exams in rats, monitoring stem cell transplants in the brain and evaluating new radiopharmaceuticals.

Preclinical imaging allows investigators to perform the same type of studies in animals as in humans, using similar imaging equipment. All studies are performed with the animals under anesthetic in order to obtain motion free imaging. Basically, any study that can be performed in humans can be replicated in small animals within the McMaster Preclinical Imaging Facility, with the added ability to image animals considered bio hazardous through the use of sealed microenvironment biochambers.

The facility has advanced processing software that permits for the corregistration of multi-modality images, as well as an advanced data analysis using Amira visualization software. Custom software can also be developed should a user require further processing and analysis or the implementation of advanced algorithms.

Imaging of Brown Adipose Tissue (BAT) in the North American Deer Mouse using FDG PET

PI: Grant McClelland, Ph.D. (Biology)
Investigator: Cayleih Robertson

Brown adipose tissue (BAT) is a highly vascularized, innervated tissue and is the most important site of non-shivering thermogenesis in adult rodents and most neonatal mammals, including humans. The North American deer mouse is the most widespread North American mammal and is found at altitudes up to 4300 m above sea level in the Rockies. One goal of this research is to try and understand how adaptations in the use of BAT may have helped deer mice colonize and thrive in extreme conditions such as high altitude environments that are snow covered for most of the year.

The Role of Microbiota in Functional GI Diseases

PI: Premsyl Bercik, M.D. (Medicine)
Investigators: Sacha Sidani and Giada De Palma

It has been proposed that several GI diseases such as Crohn's disease and irritable bowel syndrome (IBS) are the result of bacterial interactions in the gut. The ultimate goal of this research is to better understand the role of this microbiota in these diseases and to develop cures for these disorders.In this experiment, germ-free mice were colonized with human stools from a patient with IBS. Mice were kept under two types of customized humanized diets (Type 1 or Type 2). After 3 weeks, mice underwent CT imaging using 200 µl of gastrographin administered via oral gavage 2 hours prior to imaging. With the type 1 diet, CT imaging depicted normal cecum and intestinal lumen while animals fed the Type 2 diet, appeared extremely bloated and with enlarged cecum, thus confirming the role of both diet and microbiota in IBS.

Modeling Psychiatric Brain Abnormalities in Live Rats with MRI, PET and CTPI

Ram Mishra, Ph.D. (Psychiatry and Behavioural Neurosciences)
Investigator: Ritesh Daya

Functional imaging studies in psychiatric patients have established the presence of brain metabolic abnormalities. These abnormalities are commonly characterized as hypo- or hyperfrontality (abnormalities associated with the frontal cortices of the brain). These phenomena are also impacted by the action of cognitive tasks during imaging assessment.

We have developed a translational analysis for the assessment of brain metabolic function in rodents using MRI-PET-CT imaging. The imaging process is designed to mimic the assessment of metabolic brain function in humans incorporating cognitive tasks and activation states in rodents. We have demonstrated that MRI-PET-CT imaging in live rats is a robust analysis to assess the content and face validity of animal models of psychiatric disorders and subsequently to investigate novel therapies for these disorders.

MIIRC@M: Medical Imaging Informatics Research Centre at McMaster University

Report submitted by: Dr. D. Koff

The Medical Imaging Informatics Research Centre at McMaster University (MIIRC@M), a research initiative of the Department of Radiology, Faculty of Health Sciences, aims at bringing together radiologists and engineers in order to bridge the gap between clinical studies and computer sciences to solve specific issues in medical imaging.

As part of the Radiology Department at McMaster, MIIRC@M has access to over 70 staff radiologists and nuclear medicine physicians, 32 residents and 10 fellows; state-of-the-art medical imaging equipment with 6 clinical MRI and 1 research MRI, 8 CT and 1 PET-CT; and over 700,000 studies per year stored on 2 GE Centricity PACS.

MIIRC@M has access to the University and Hospital's Research Ethics Board (REB), Research Office (management of grant applications) and Industry and Liaison Office (contracts and IP management).

MIIRC@M is the result of efforts of the radiologists at Hamilton Health Sciences, and the researchers and scientists at McMaster University.

VISION

The vision of MIIRC@M is to foster seamless integration of medical images in the daily world of healthcare professionals with appropriate delivery of relevant content and decision support.

MISSION

The mission of MIIRC@M is to lead research and development of solutions that assist in implementing and maximizing benefit of image enabling.

GOALS & OBJECTIVES

1. MIIRC@M is a research arm of the Department of Radiology, and strives to provide support to faculty, residents and fellows in the following ways:Help in identifying and building research projects
- Writing research proposals

- Structure budgets and help identifying sources of funding
- Drive the Principal Investigator (PI) through REB process and identify the appropriate path
- Interact and facilitate relations with the McMaster Industry Liaison Office (MILO)
- Facilitate access to statistical support
- Track departmental research projects and monitor the use of funds
- Offer technical infrastructure to radiologists, engineers, students and any researcher at McMaster University

2. Identify specific projects related to the use of imaging informatics and information technology in medical imaging:

- Build a team of experts from various fields and backgrounds
- Identify industry and government partners
- Write and submit grants

3. Build an education program to train medical imaging informatics professionals in partnership with Mohawk College and McMaster University.

4. The existing and future research projects at MIIRC@M are in five major areas:

   a. Imaging Informatics and Information Technology
      i. Intelligent Content Delivery
      ii. Foreign Exam Management
      iii. Machine Learning and Artificial Intelligence

   b. Population Health and Imaging Safety and Appropriateness
      i. Radiation Exposure Monitoring Phase 1
      ii. Radiation Exposure Monitoring Phase 2
      iii. Canada Safe Imaging

   c. Validation of Technology
      i. Image Compression
      ii. Dual Energy
      iii. Tomosynthesis
      iv. Ultrasound/CT-MR fusion and registration

   d. Advanced Image Processing
      i. Interactive Modelling and Evaluation of Tumour Growth
      ii. Medical Content Based Image Retrieval

   e. Nanotechnology
      i. Endovascular intervention with bioabsorbable stents
      ii. Image guided tumor ablation
      iii. Venous stenosis
      iv. Islet cell transplantation
      v. Endovascular treatment of venous thrombus

TEAM

DIRECTOR

David A. Koff, MD FRCPC, has been chair of the Department of Radiology at McMaster University and chief of Diagnostic Imaging at Hamilton Health Sciences for the past eight years, currently in his second term. He is Professor of Radiology at McMaster University, and is founder and director of MIIRC@M, the Medical Imaging Informatics Research Centre at McMaster, leading research projects on radiation monitoring and integration of images in the electronic patient record.

For the last 20 years, Dr. Koff's research has centered on the electronic communication and workflow integration of medical images, and he helped develop the Canadian standards on lossy compression. He co-founded Easy Pax Inc, in 1998, a Canadian corporation developing and marketing a set of tools and services for image transmission over the Internet. He has been a co-founder of IHE Canada (Integrating the Healthcare Enterprise), is a member of the board of IHE International and a member of the IHE section of the Medical Informatics committee at RSNA, and has recently been appointed co-Chair of the IHE Radiology Planning Committee. He has been running a Medical Imaging Informatics conference for the past eleven years, and contributes to multiple radiology societies and journals.

Before his appointment at McMaster, Dr. Koff held positions as a staff radiologist and research associate at Sunnybrook Health Sciences in Toronto, assistant professor at University of Toronto, and staff radiologist at the Montréal Heart Institute at the Université de Montréal. Before coming to Canada, Dr. Koff graduated in medicine and radiology from Université Paris V Rene Descartes, France and managed a large radiology practice for 18 years. His clinical expertise is mainly in chest and body radiology with a special interest in ultrasound.

RESEARCH ASSOCIATES

Thomas Edward Doyle holds a Ph.D. in Electrical and Computer Engineering Science from the University of Western Ontario, Canada. He also holds a Masters of Engineering Science (M.E.Sc) in Electrical and Computer Engineering, a Bachelor of Engineering Science (B.E.Sc) in Electrical and Computer Engineering, a Bachelor of Science (B.Sc) in Computer Science. Dr. Doyle has taught at McMaster University, the University of Western Ontario, and the University of Ontario Institute of Technology. Dr. Doyle's technical domain research areas include biomedical signal processing, health informatics, human-computer interfacing (HCI), brain computer interfacing (BCI), and machine learning for the augmentation, rehabilitation, and enhancement of human attributes. His research investigates the communication channel between the man and the machine for the enhancement of assistive and rehabilitative computing technology. Recent research has focused on the hearing prosthetic and the use of electrophysiological signals for improved autonomous control. This research has resulted in the development of a model that successfully classifies its users affective response by using a learning algorithm on several hearing related electrophysiological signals.

Paul Babyn, MD FRCPC, is the Department Head of Medical Imaging for the Saskatoon Health Region and the University of Saskatchewan.

PROJECT MANAGER

Jane Castelli, for almost 20 years has been involved in developing large international research projects from their point of identification to project completion. Ms. Castelli has worked on private sector funded projects, worth +100 M$ as well as projects funded through government grants.

STATISTICIAN

Sandra Monteiro completed her PhD in Psychology, Neuroscience and Behaviour at McMaster University. She holds several titles at McMaster University. Her primary position is Assistant Professor

in the Department of Clinical Epidemiology and Biostatistics with Associate status in the Department of Radiology. Sandra is also a senior Scientist in the Program for Educational Research and Development, a research fellow at the McMaster Institute for Innovation & Excellence in Teaching and Learning and a senior Psychometrician at Touchstone Institute. Sandra also maintains membership status with the Wilson Centre at the University of Toronto. Sandra has a strong background in research methodology and statistics, which she puts into practice consulting with various health professionals. At McMaster, Sandra guides Radiology Residents in their design of clinical and education research. In particular, Sandra applies her knowledge to improve the quality of study designs, grant applications, manuscript preparation, research presentations and data analysis.

COLLABORATORS

In addition to the MIIRC@M core staff noted above, MIIRC@M has established collaborations with a number of prestigious researchers who have or intend to work with MIIRC@M on various projects. The specifics of these projects can be found in the MIIRC@M Projects section of this document. The following individuals are considered collaborators with MIIRC@M:

Dr. Mike Noseworthy	Department of Electrical and Computer Engineering, McMaster University
Dr. Geoff Norman	Department of Biostatistics & Epidemiology, McMaster University
Dr. Todd Hoare	Department of Engineering, McMaster University
Dr. Naveen Parasu	Department of Radiology, McMaster University
Dr. Mitchell Levine	Department of Biostatistics and Clinical Epidemiology, McMaster University

MIIRC@M PROJECTS

MIIRC@M, part of the Department of Radiology at McMaster University, has been formed to create and facilitate projects in both research and education.

1. RESEARCH PROJECTS

Since MIIRC@M was established, the primary function of the group has been to develop research projects. As outlined in the Objectives Section of this document, MIIRC@M's aim is grow research projects from the point of identification to project completion. The achievement of this objective is demonstrated through the following successful projects.

1.1. Image Compression

Based on prior work performed by Dr. David Koff over the last 10 years on Lossy Compression applied to Medical Images, leading to the publication by the Canadian Association of Radiologists of a National Standard for the use of Irreversible Compression, the following research was commissioned:

1.1.1. Real Time Automatic Quality Assessment and Control for MedicalImaging Compression

Principal Investigator: Dr. David Koff, McMaster University

The goal of this research project is to supply radiologists with a set of computer software tools for automatic image quality assessment and quality control that provide effective, fast, and easy-to-use guidance for the compression of a wide variety of medical images. The timeframe for this project was November 2009 to November 2010.

Funded by GE for $30,000

1.1.2. Evaluation of Irreversible Compression Ratios for Thin Slice CT Images

Principal Investigator: Dr. David Koff, McMaster University

The first study had demonstrated some unexpected discrepancies for certain types of CT images, mainly brain and liver, at compression ratios lower than anticipated and for a certain type of compression algorithm. Therefore further evaluation was required to refine this finding. The timeframe for this project was December 2008 to January 2010.

Funded by Canada Health Infoway for $183,750.00.

Results: the Compression Standards were revised accordingly in April 2010.

1.1.3. Adoption of Irreversible Compression Phase 1

Principal Investigator: Dr. David Koff, McMaster University

After demonstrating that Lossy Compression is acceptable, it needed to be implemented in production. The scope of this study was to assess the capacity of the PACS to support compression, test physician engagement and draft standards of practice. The timeframe for this project was October 2010 to March 2011.

Funded by Canada Health Infoway in partnership with Mohawk Shared Services for $94,000.00.

1.1.4. Objective Quality Assessment and its Use in Optimizing Diagnostically Lossless Compression of Medical Images

Principal Investigator: Dr. Zhou Wang, University of Waterloo

This project aimed to:

a) Design novel automatic image quality measures for medical images that can accurately predict subjective quality evaluations by radiologists;

b) Develop advanced medical image compression algorithms that are optimized for our novel quality measures; and

c) Validate and optimize the image quality assessment and compression algorithms and develop a prototype control protocol that can be readily used by radiologists and hospital technical staff.

The research work is carried out through close university-hospital-industry collaborations, and is expected to benefit Canada's healthcare, workforce and medical imaging-based economy. The timeframe for this project is October 2011 to October 2014.

Funded by NSERC-CRD in partnership with Agfa for $40,000 a year for 3 years. An additional $30,000 a year from OCE, for a total value of $ 210,000.

1.2. REM: Radiation Exposure Monitoring and Evidence Based Decision Support – Phase 1

Principal Investigator: Dr. David Koff, McMaster University

In Phase 1, NRC, Agfa and McMaster University (with Hamilton Health Sciences Corporation) have collaborated on a project focused on radiation monitoring. The project lasted two years and developed core technologies in several areas:

- Dose Collection Tool Kit and Dose Registry: a set of tools/applications for skimming data from DICOM headers, MPPS servers, and RIS. This package was built on Agfa PACS services, and a set of open-source toolkits. It is a natural extension of Agfa IMPAX's portfolio and is now offered to existing customers, as well as customers with non-Agfa PACS systems. A new professional service is also built to supporting this package.

- Data Analysis Platform: The evidence based decision support platform comprises a comprehensive set of tools for data mining and decision support, a protocol and guidelines repository and a host of highly interoperable applications that provide visualization, benchmarking and just-in-time support for technologist, physicians and decision makers in healthcare. As Low As Possibly Achievable (ALARA) protocols will be generated, and Key Performance Indicators

- Decision Support Applications: this package includes benchmark portals (to be used by health authority such as Health Canada for monitoring purpose, for hospital comparison, etc.), alert system for over dosing (mostly for technologist) and checking appropriateness of procedures.

Phase 1 has been completed leading to a commercial product named REM and marketed by Agfa, with royalties to McMaster University. The timeframe for Phase 1 of this project was from November 2009 to November 2011.

Funded by NRC and Agfa HealthCare for $3,050,000

1.3. A Pan-Canadian Data Collection and Analysis Platform for Patient Radiation Protection and Safety - Phase Two of the REM Project

This project aims to provide researchers with the tools needed to understand the long term effect of low dose medical radiation at the population level, create and facilitate the adoption of evidence-based appropriateness guidelines, and contribute to the concept of personalized medicine in delivering adapted care to patients. This project will build on the work already done in REM, taking the data that is collected at the individual PACs/hospital level and developing a national platform for the data to be stored which will create a nation-wide automatic collaboration solution to reconcile radiation dose with patient medical information. This repository of

data will be available for researchers to study the long-term effect of low dose medical radiation at the population level. In addition, this platform will allow physicians to conduct benchmarking and provide real-time decision support for procedure justification.

The timeframe for this project is April 2015 to April 2020. Funding has been provided through a SOSCIP award sponsored by IBM for $1,000,000 through in kind funds.

1.4. Secure Intelligent Content Delivery System for Timely Delivery of Large Data Sets in a Regional/National Electronic Health Record

Principal Investigator: Dr. David Koff, McMaster University

The objective of the proposed project is to develop technology that addresses the timely delivery of large data sets, such as diagnostic images, to consumers in the context of their local working environment. The innovation is two fold:

- A solution to render information in viewing clients using ubiquitous Internet and Web technologies along with streaming protocols such that data can be delivered to the user from where it is situated. This concept is a “pull model” and is called “on-demand viewing.

- A solution that stages content at the “edge of the WAN” in advance of a user requesting the data so that it can be integrated into the local environment and delivered quickly in response to a request. This concept is a “push model” and is called “intelligent content delivery” (ICD)

As part of intelligent content delivery, on-demand viewing, there is a need to ensure secure communication of data, proper access control to data and secure audit of use of data. Current systems support secure communications, access control and audit, but do so in the context of the local enterprise only, the extension of such capabilities to regional implementations is not easily achieved.

The secondary objective of the proposed project is to develop technology that addresses the privacy and security requirements for sharing of large data sets.

The key goal of the research project is to accelerate the adoption of seamless sharing within the Canadian healthcare environment. Successful completion of this goal will contribute to the creation of an informatics centre that fosters collaboration between competitive private sector companies to solve systems interoperability challenges. The timeframe for this project was November 2011 to December 2015.

Funding by ORF: $1,411,000.00 for a total project value of $4,235,094 (cash and in-kind).

1.5. Detection of pulmonary nodules with dual energy subtraction chest radiography

Principal Investigator: Farheen Manji, McMaster University

The objective of this study was to assess the clinical benefits of DES radiography by comparing the speed and accuracy of diagnosis of pulmonary nodules with DES versus traditional chest x-rays. Five radiologists and five radiology residents read the DES and traditional chest x-rays of 51 patients, 34 with pulmonary nodules and 17 without. Their accuracy and speed in the detection of nodules were measured using specialized image display software. The timeframe for this project was March 2013 to August 2013.

This project was not funded.

1.6. Tomosynthesis Use in Detecting Subtle and Occult Hip Fracture

Principal Investigator: Naveen Parasu, McMaster University

The purpose of this project is to conduct a pilot study to demonstrate that using tomosynthesis, in conjunction with x-ray, is better at detecting subtle and occult hip fractures than x-ray alone. In addition, the project will demonstrate if using tomosynthesis can reduce the number of required MRIs. The specific aim of this study will be to demonstrate that tomosynthesis can be used, instead of MRI, following a negative x-ray for a patient who still presents clinical symptoms of a fracture. This change in practice will be of particular importance to the almost 75% of Canadian hospitals which do not have a MRI machine (CIHI, 2013). If the study objectives are positive, a large, multi-centre study will be considered. The timeframe for this project is December 2014 to December 2015.

Funding by GE HealthCare: $175,000

1.7. Ultrasound-Triggered Controlled Capsules Enabling Both Controlled Drug Release and Nanoparticle Propulsion Within Tumours

Principal Investigator: Dr. David Koff and Dr. Todd Hoare, McMaster University

The purpose of this project is to develop a nanocapsule-based drug delivery vehicle capable of releasing both drug-loaded nanoparticles and controlled doses of drug “on demand” following ultrasound-based signaling. This will be important for the treatment of cancer, where the key features of this project (i.e. local ultrasound-triggered delivery, the ability to release drugs in both nanoparticle and solution form, and the potential capacity for nanoparticle propulsion) all have potential benefits in terms of generating local, staged, and penetrating drug delivery deep into tumours.The timeframe for this project is September 2016 to June 2018.

Funding by McMaster University Seed Grant: $50,000

2. EDUCATIONAL PROJECTS

One of MIIRC@M’s objectives is to build an education program to train medical imaging informatics professionals. This has been done by the development of Highly Qualified Personnel (HQP), Youth Outreach Programs and courses and programs offered at McMaster University.

2.1. Highly Qualified Personnel (HQP)

Through its various research projects, MIIRC@M has developed HQP at all levels, from undergraduate to doctoral. MIIRC@M has solicited and developed co-op undergraduate students from Mohawk College, McMaster University and the University of Waterloo, Masters students from McMaster University, University of Waterloo and the University of Ontario Institute of Technology, and Doctoral students from the University of Ontario Institute of Technology and Instituto de Informatica, UFRGS, Brazil. Students that have worked with MIIRC@M have gained knowledge on medical imaging informatics, project management, software development and clinical testing. As MIIRC@M has developed strong relationships with industry partners, this provides students with a unique opportunity to learn first-hand of real world problems and provide them with the practical experiences essential for becoming innovators.

2.2. Youth Outreach Program

As part of the ICD Project, MIIRC@M will be developing a Youth Outreach Program that will allow high school students, who rarely get an opportunity to experience the practice of medicine other than as a patient, to learn what Radiology and Healthcare IT is all about. This program was developed through the Applied Health Sciences Open House in Spring 2014.

2.3. M. Sc. eHealth – McMaster University

As part of MIIRC@M’s objective, Dr. Koff and Dr. Doyle have had an integral role in developing and expanding the M. Sc. of eHealth at McMaster University. The objective of the program is to produce Masters level graduates with high quality training in the broad interdisciplinary area that spans eHealth. The program of study emphasizes industry relevant academic research and development.

The MSc eHealth degree is truly interdisciplinary and based on a partnership of the Faculties of Health Sciences (Clinical Epidemiology and Biostatistics Department), Engineering (Computing and Software Department) and Business (Information Systems area in the De Groote School of Business).

CANADA SAFE IMAGING(CSI)

In 2012 the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO) launched an initiative that was supported by 77 countries and 16 organizations, titled the "Bonn Call-for-Action," which outlines ten major strategies for promoting radiation protection. In response, the European Society of Radiology (ESR) launched the EuroSafe Imaging Campaign in March 2014. The new campaign, which brings together many stakeholders, will strengthen medical radiation protection across Europe following an inclusive approach. Similarly, the American College of Radiology and the Radiological Society of North America formed the Joint Task Force on Adult Radiation Protection in 2010 to address concerns about the surge of public exposure to ionizing radiation from medical imaging. The Alliance for Radiation Safety in Pediatric Imaging developed the Image Gently® campaign in the summer of 2007.

To date, there is no comprehensive national strategy in Canada for radiation safety as it relates to medical imaging care. Therefore a Coalition was formed out of McMaster University Department of Radiology/MIIRC@M, called **Canada Safe Imaging**, to address this need for a national strategy and action plan as it relates to radiation safety for medical imaging care in Canada.

The Coalition represents a collaborative undertaking between government agencies, professional associations, universities, colleges, national research institutions and hospitals. Within each sector, a multi-disciplinary approach has also been adopted, involving partners, researchers, technologists, medical and health physicists and other health care providers using or prescribing the use of radiation. **McMaster University** has been named the Oversight Committee for Canada Safe Imaging and Dr. David Koff has been named the Chair.

The Coalition shall focus on strengthening medical radiation protection in patients and fostering a culture of radiation safety in healthcare. The primary responsibility of the Coalition shall be to develop awareness and adoption of current and emerging radiation patient protection strategies for Canadians, promote procedural appropriateness that attains greatest medical benefit, support evidence-based best practice guidelines and facilitate a strategic approach to conduct scientific inquiry on the effects of radiation on human health.

ANNUAL RESEARCH DAY

The McMaster University Diagnostic Radiology Program at McMaster University Research Day is a comprehensive departmental research day for all trainees. Invited presentations include participants from the Diagnostic Radiology Residency and Fellowship programs, as well as from Basic Science graduate students. Radiology related undergraduate projects are also eligible for submission. The primary goal of the day is to share scientific projects and substantial work performed at McMaster. In addition, the research day is a forum to formally present research projects in a similar format to more formal scientific meetings. Presentations are formally adjudicated, with projects of excellence recognized with a formal award.

All residents must present at the research day at least once, in order to meet program requirements for residency at McMaster. We have also recently made it mandatory that our fellows must present at research day.

Formal presentations require an oral presentation at an assigned date/time in the day. These are be time limited, including consideration of time for discussion and questions.

All presentations are formally adjudicated; this panel includes 3 judges: one from basic science, one from clinical radiology

RESEARCH FUNDING

FUNDING PERIOD	NAME	ROLE	FUNDING SOURCE	AWARD	PROJECT TITLE
2014-2015	**Chiavaras Mary Margaret** Finlay, Karen Parasu, Naveen	Principal Investigator Co-Investigator Co-Investigator	Physician Services Incorporated (PSI)	$167,500.00	IMPROVE Randomized Controlled Trial for a multicenter, multi-disciplinary study comparing various ultrasound –guided, persutaneous treatments for lateral epicondylistis (“tennis elbow”)
2012-2014	**Chiavaras Mary Margaret** Finlay, Karen Parasu, Naveen	Principal Investigator Co-Investigator Co-Investigator	Radiological Society of North America (RSNA)	$40,000.00	IMPROVE study – Impact of Platelet Rich plasma Over alternative therapies in patients with lateral Epicondylitis: A Multicenter Randomized Trial Comparing Autologous Platelet Rich Plasma (PRP) versus Autologous Whole Blood versus Tenotomy on Pain and Quality of Life in Patients with Lateral Epicondylitis.
2012-2014	**Chiavaras Mary Margaret** Finlay, Karen Parasu, Naveen	Principal Investigator Co-Investigator Co-Investigator	Hamilton Health Sciences (HHS)	$30, 000.00	IMPROVE Study: IMpact of Platelet Rich plasma Over alternative therapies in patients with lateral Epicondylitis.
2014-2018	Tsai, Scott	Co-Investigator	Canadian Institutes of Health Research (CIHR)	$649,624.00	Neuro VISION Study: Detection and Neurological Impact of Cerebrovascular Events in Noncardiac Surgery Patients: A Cohort Evaluation Study

and a third invited external judge. Selection of judges includes consideration of no conflict of interest; the judge must not be coauthor or direct supervisor for any presented projects.

RESEARCH PUBLICATIONS

(See Appendix for complete list of publications)

Table: summary of publications for department

YEAR	RAD PAPERS/ TEXTS	RADIOLOGISTS INVOLVED	NM PAPERS/ TEXTS	NM PHYSICIANS INVOLVED	MP PAPERS/ TEXTS	MP PHYSICIAN INVOLVED	RESIDENT PAPERS	RESIDENTS INVOLVED
2012	46	62	20	23	12	19		
2013	52	57	11	12	3	2		
2014	48	59	19	19				
2015	41	44	18	18			1	1
2016 -	16	30	31	32			2	2
TOTAL	203	252	99	104	15	21	3	3

Research Report - We have included the Research Support Overview by Departments Report in our appendices


roduction
ndoleak is a persistent blood flow within the aneurysm sac
following endovascular aneurysm repair (EVAR)

CLINICAL SERVICES & PROGRAMS

Clinical Services & Programs

Our different imaging departments support clinical activities at each site and provide the best expertise available with fellowship trained radiologists; our mission is to ensure high quality and continuity of care as we are the ultimate resource for patients in our region.

Over the past year, we have started to move away from the site-based expertise to an enterprise-wide concept at HHS, expanding to St Joseph's Healthcare Hamilton in the coming year. This translates in the implementation of subspecialty divisions under the leadership of a Division Head, who is responsible for all aspects related to staffing, recruitment, quality and standardization.

HAMILTON HEALTH SCIENCES DEPARTMENT OF DIAGNOSTIC IMAGING

Hamilton General Hospital

1. Neuroradiology and neurointerventional radiology
2. Cardiac imaging
3. Breast imaging
4. Interventional radiology and vascular imaging

Juravinski Hospital & Cancer Centre

1. Oncology imaging
2. Breast imaging
3. Musculoskeletal imaging
4. Cardiac imaging
5. Interventional radiology

MUMC

1. Pediatric imaging
2. Pediatric neuroradiology
3. Pediatric and obstetrical ultrasound
4. Gastrointestinal imaging
5. Interventional radiology

HHS DI MUSCULOSKELETAL IMAGING:

Six Fellowship trained MSK Radiologists based at the three sites.

Site specific MSK Imaging strengths are as follows;

1. HGH: trauma imaging, MSK US, MR Arthrography, MSK intervention including joint injections, blocks, percutaneous lavage of calcific tendinopathy, alcohol ablation of Morton's Neuroma and post traumatic neuromas and vertebroplasties.
2. MUMC: general MSK imaging including MR Arthrography and pediatric MSK imaging including bone and soft tissue tumours.

3. JHCC: general MSK imaging, MSK US and US guided interventional procedures, MR Arthrography, Imaging of bone and soft tissue tumours.

At the HGH and JHCC, there are dedicated MSK Imaging days at which the MSK radiologists directly supervise MSK US lists and interventional procedures. We are currently introducing this to MUMC as well. This will enable the 3 sites to be adequately staffed by sub specialist trained MSK radiologists at all times. It will also allow for the development of a MSK US Programme at MUMC.

Support of the site MSK related rounds. These include Bone Tumour Rounds and Sarcoma Rounds at the JHCC and Orthopedic Rounds at MUMC. In addition, the MSK radiologists have been very involved with the MacHand Group (a collaboration of orthopedic and plastic surgeons, physiatrists, radiologists, physiotherapist, occupational therapists and others with an interest in upper extremity disorders). The MSK Radiologists have presented at the MacHand rounds as well as being on the organizing committee for the annual meeting. In addition, the MSK radiologists have and continue to participate in a variety of research projects and have presented at numerous meetings.

There is a joint JHCC and SJHH MSK Imaging Fellowship Programme.

Future endeavors include greater integration between the 3 sites, more regular rounds and greater standardization of MSK Imaging protocols.

Three MSK Fellowships offered between HHS and St. Joseph's Healthcare Hamilton.

HHS DI BREAST IMAGING PROGRAM:

The breast imaging program is a clinical service that has seen major transformation with the creation of the new Breast Assessment Centre at the Juravinski Hospital, and which includes:

1. Mammography
2. Breast Ultrasound
3. Breast MR
4. Breast related interventional procedures (including stereotactic and ultrasound guided breast biopsies, needle localizations and ductography).
5. Regular rounds and meetings with pathologists, surgeons and oncologists to review active cases

The strength of the program includes:

1. Dedicated mammography technologists interested in teaching residents and fellows the technical and mammography QC
2. Dedicated breast ultrasound technologists who help guide and hone the ultrasound skills of the residents and fellows
3. Dedicated breast imaging radiologists, who each read greater than 2000 mammograms per year and are interested in teaching.
4. A large volume of radiology and pathology through the hospital and the Ontario Breast Screening Program allowing extensive procedural experience
5. Teaching of radiology residents and fellows as the Juravinski Hospital program is part of the McMaster Resident and Fellowship Program
6. Radiology Pathology Correlation Rounds:

Every Monday the radiologists, pathologists, surgeons, residents, fellows, mammo technologists & ultrasound technologists meet and review 15 - 20 breast biopsies performed the previous week. After the rounds, a combined radiology/ pathology report is appended to each pathology report and sent to the referees.

7. Multidisciplinary Breast Rounds:

Every Wednesday the radiologists, radiation and medical oncologists, breast surgeons, fellows, pathologists and support staff meet and review interesting and challenging cases. These rounds influence patient management.

Summary:

The strength of the McMaster University Breast Imaging Program is due to a large volume of interesting case work and a dedicated multidisciplinary group of individuals whom work together like clockwork. There is a concerted effort to ensure that radiology, pathology and oncology residents and fellows are communicating with each other and learning the full gamut of breast diseases and not just their own subspecialty. It is this team relationship that is behind the strength of the breast imaging program.

HHS DI OBSTETRICAL ULTRASOUND:

The primary role of the service/program is to support the Maternal Fetal Medicine program, which is the major tertiary care referral centre for high risk obstetrics in the region.

The service is staffed by 5 obstetricians and 1 radiologist involved in high risk obstetrical ultrasound.

The program is a major component of the Maternal Fetal Medicine Fellowship Program in The Department of Obstetrics and Gynecology. It also provides the training in obstetrical ultrasound for the residency programs in the Departments of Radiology and Obstetrics and Gynecology.

Rounds conducted by the program include weekly Obstetric/ Perinatal/Genetics rounds.

HHS DI GASTROINTESTINAL PROGRAM:

1. City wide CT cross sectional abdominal imaging is generally performed by all radiologists at each site.
2. CT Colonography is done only at MUMC.
3. CT enterography is done at all sites and read by most radiologists at each site
4. The following GI procedures are routinely performed at MUMC on pediatric and adult patients. Recent Installation of new equipment has resulted in 2 functioning rooms being run simultaneously, including;

a) Single and double contrast lower G.I
b) Single and contrast upper G.I
c) Voiding cystourethrography
d) Swallowing assessments
e) Sinograms and fistulograms
f) Rarely small bowel enterocolysis
g) Defecogarms
h) Other

5. MR enterography, MR of the perineum, MR of the liver and pancreas, and MRCP are routinely done pediatric and adult patients at MUMC. I am unaware of MR enterography or MR of the perineum being done at any of the other sites.
6. Weekly GI rounds with departmental head Dr. Issenman are on Fridays at 12:00 – 1:00 in 2S27.
7. Weekly Hepatobiliary rounds are held at JHCC on Thursdays 7:30-8:30 a.m.
8. Monthly Surgery, Radiology, Pathology rounds – every third Thursday, 8:00-9:00a.m. in 2S27

Future goals for HHSC GI program:

1. Changes to resident's G.I rotation to improve quality of

teaching of skills and objectives required to meet program requirements and expectations successfully.

2. Hopefully a collaborative team effort to improve service to the G.I department.

HHS DI Body Imaging:

There are nineteen radiologists with fellowship training in body imaging or cross-sectional imaging across the three sites.

Site specific strengths in body imaging:

1. JHCC: oncologic imaging, hepatobiliary-pancreatic imaging, colorectal cancer, CT colonography
2. HGH: trauma, general cross-sectional imaging
3. MUMC: inflammatory bowel disease, hepatobiliary-pancreatic imaging, colorectal cancer, CT colonography, fluoroscopy

Interdisciplinary rounds supported by the body imaging program include hepatobiliary-pancreatic rounds and colorectal cancer rounds at the JHCC.

Research activities include iodinated contrast induced nephropathy and involvement in PAN Canada lung screening trial.

There are 4 cross-sectional imaging fellowships offered across the three sites.

HHS DI PEDIATRIC IMAGING:

Pediatric Imaging is performed in all imaging modalities at MUMC.

The new pediatric radiology group supports:

1. The Neonatal Intensive Care Unit
2. The New Pediatric ER
3. The Pediatric GI medicine and GI surgery programs
4. The Pediatric Neurology and Neurosurgery programs
5. The Pediatric Nephrology and Urology programs

There are now 4 radiologists, fellowship trained in pediatric neuroradiology. The onsite radiologists participate in the 2 weekly neuro-oncology and pediatric neurology rounds. The program provides teaching to pediatric neurology residents through 1-month electives.

The pediatric radiologists are also participating in the Tumour Boards, Hemo-oncology, and GI rounds as well as weekly NICU rounds, and monthly Radiology Urology Nephrology rounds.

We have reviewed and improved all imaging protocols in CT and MR, and have improved radiation safety in CT thanks to a new CT scanner installed this year.

The next step will be to provide in-house dedicated pediatric training for residents and fellows.

There is a general radiology and adult GI component, for the adult services that remain at MUMC including a busy fracture clinic and preoperative assessments, and for the new Urgent Care Centre.

One fellowship offered in pediatric radiology.

HHS DI CARDIAC IMAGING:

Cardiac Imaging is based at the Hamilton General campus in support of the regional cardiology program. It is staffed by two radiologists with special interest in cardiac imaging and one cardiologist with specialized training in cardiac CT. Our modalities include a 64 slice Toshiba CT and two 1.5 T Siemens MRI scanners. We provide MRI/CT support for regional cardiologists, electrophysiologists, internists and cardiac surgeons from the LHIN.

Cardiac CT is focused on coronary artery disease stratification, post-operative coronary graft assessment and pulmonary vein / coronary sinus mapping. Cardiac MR imaging has a focus on cardiomyopathy investigation, myocardial viability, aortic pathology and minor focus on adult corrected congenital heart disease.

Current cardiac imaging research interest in conjunction with cardiology / cardiac surgery programs has been focused on CT assessment of by-pass grafts, stress perfusion MR in post-operative MI patients and MR evaluation for aortopathy in adult congenital heart disease patients.

HHS VASCULAR AND INTERVENTIONAL RADIOLOGY:

The HHS Vascular and Interventional Radiology Program is comprised of six fellowship trained interventional radiologists based at the three HHSC sites: McMaster University Medical Centre (MUMC), Juravinski Hospital and Cancer Centre (JHCC) and the Hamilton General Hospital (HGH), The procedures at MUMC are focused on pediatric and women's health which include fibroid

embolization and treatment of pelvic congestion syndrome. The procedures at JHCC support the centre's oncology and hepatobiliary programs which include TIPSS, biliary and GI stenting and interventional oncology. The work at HGH is focused primarily on endovascular interventional working in conjunction with the vascular surgery and trauma programs. The multidisciplinary work is facilitated by the Vascular Rounds with the vascular surgeons at the HGH every Wednesday morning and the Hepatobiliary Rounds with the hepatobiliary surgeons every Thursday morning. There is currently a Vascular and Interventional Radiology Fellowship program involving all three sites to provide the fellow a comprehensive experience in a variety of procedures. Support is also provided to the McMaster Radiology residency program with residents rotating through the sites and providing teaching rounds on interventional radiology topics to the residents.

There is one interventional fellowship position offered.

HHS EMERGENCY RADIOLOGY:

Based at the HGH, the new Emergency Radiology program has been successful at building strong relation with the Emergency Department. Emergency Radiology is a rapidly developing radiological subspecialty focused on imaging of critically ill patients. Emergency Radiology (ER) Division at McMaster University was established in 2012.

Dr. Michael Patlas was selected to lead the new division. His mandate was to enhance clinical and academic collaboration with Trauma Program and Emergency Medicine at McMaster. He upgraded imaging protocols in the emergency department and changed patterns of emergency and trauma imaging utilization at McMaster. His ground-breaking research on use of oral contrast for patients with acute abdominal pain was cited by the Radiological Society of North America (RSNA) and the American College of Radiology (ACR).

Dr. Patlas' efforts during last 4 years resulted in 25 peer-reviewed papers, four book chapters, and 38 abstracts published in collaboration with McMaster, national and international colleagues. Dr. Patlas supervised multiple research projects of McMaster trainees. Presently, these projects resulted in publication of 14 peer reviewed manuscripts.

ST. JOSEPH'S HEALTHCARE HAMILTON DEPARTMENT OF DIAGNOSTIC IMAGING

The Department of Radiology supports SJHH's leading programs in respirology, thoracic surgery, nephrology and urology as well as head and neck.

SJHH DI ULTRASOUND IMAGING:

The program has 3 fellow trained cross sectional radiologists and 6 residents rotating yearly. Four to six elective medical students have expressed interest in ultrasound while rotating in the Department.

Four to six ultrasound technologist students are also in the program at any given time.

Site specific ultrasound (US) imaging strengths are as follows:

1. Hands on training
2. US reporting
3. US guided procedures
4. US related research projects
5. Weekly US rounds

Future endeavors include:

1. Greater involvement of the Staff radiologists in teaching residents and fellows.
2. Encouraging residents to be involved with research projects at St Joseph's.

3. Expending US service for Emergency and In-Patient with portable bedside US services.

Two cross-sectional fellowships offered.

SJHH INTERVENTIONAL RADIOLOGY:

This program has 3 fellowship trained Interventional radiologists.

We provide dedicated 24x7 interventional radiology (IR) related imaging and procedural service to:

1. Thoracic surgery
2. Urology, Nephrology
3. Rheumatology ENT
4. General Surgery
5. Medicine
6. Hematology, and
7. Obstetrics and Gynecology

There is a dedicated IR nurse and technologist on call service along with the interventional radiologists.

The procedures performed range from biopsy and drainage to complex embolization, oncology intervention and renal tumor ablation. There is a dedicated IR clinic to evaluate and follow-up of certain patients requiring complicated IR procedures like embolization and renal tumor ablation.

IR led difficult access rounds for nephrology patients and IR led Small Renal Tumor rounds to discuss patients for renal ablation.

Quarterly Morbidity and Mortality rounds to learn and improve on the quality of care provided. There are also various presentations at IR conferences and publications of research that are being done carried out under the supervision of the IR. One of the interventional radiologists serves as a committee member on the Canadian Interventional Radiology Association (CIRA) as well as the Society of Interventional Radiology (SIR).

Future endeavors include expanding the IR program to widen the scope of tumor ablation program, venous thrombolysis and broaden the scope of IR in women's health.

SJHH DIAGNOSTIC IMAGING MAMMO PROGRAM:

The mammo service is based out of 2 sites, the Charlton Avenue site and the King Street site. At Charlton, we have digital mammography equipment and great ultrasound machines to provide both diagnostic and OBSP mammography services. In addition, we also support the 3 breast surgeons at St. Joseph's by performing needle localizations for the OR. We have a thriving breast MRI program and are the only site in Hamilton performing MRI guided breast biopsies. At the King Street site, we have received approval to replace our analog units with a digital mammography unit. This is a great addition, as our King Street site is the second largest OBSP service provider in Hamilton. We have also been selected by the ministry to be a high risk OBSP screening site. Both our sites are equipped to perform stereotactic and ultrasound guided biopsies. We actively participate in the residency program, with the introductory mammography rotation occurring at St. Joseph's. We also provide a breast and body imaging fellowship.

SJHH DI MUSCULOSKELETAL IMAGING:

This tertiary MSK imaging program is a leader in many facets in musculoskeletal imaging in Canada.

St Joseph's Healthcare Hamilton (SJHH) has a strong referral base in sports imaging, rheumatology and orthopedics, particularly upper extremity imaging. Two MSK fellowship trained radiologists are responsible for the majority of MSK imaging at this center. The volume of MSK imaging has allowed for a dedicated daily MSK schedule. All imaging based modalities are available but there is specific expertise in Ultrasound, MRI with specific interest in MRI arthrograms. The

volume of MSK ultrasound is one of the largest in North America. Ultrasound-guided MSK intervention, particularly for sports-related injuries, are provided for via PRP injections, tenodesis, barbotage for calcific tendinosis, treatment of trigger finger, tenosynovitis including De Quervain's, treatment of ganglion cyst, joint aspiration/injections, biopsies, treatment of Morton's neuromas.

In conjunction with the JHCC, SJHH is home to a sought after MSK imaging fellowship program, which strongly supports training, research and education. There are weekly Combined Clinical Rheumatology Rounds. In addition SJHH is the primary site for the imaging rotation for the rheumatology residents. Research, including joint research with clinical specialists, is actively supported in the department and enhanced by access to a dedicated research MRI. Staff and fellows commonly present at national and international meetings. The MSK radiologists have been involved with the MacHand. The MSK radiologists have presented at the MacHand rounds as well as being on the planning committee for the annual meeting. In addition, SJHH has been the site of the North American symposium in MSK ultrasound.

SJHH DI COMPUTED TOMOGRAPHY:

The CT department at SJHH is a busy department with 2 MDCT scanners-one 64-slice and one 16-slice scanner. The 16-slice scanner is a Bariatric Scanner and also doubles as an interventional scanner with CT fluoro capability.

There is a continuous process of updating protocols and improving processes in this department. The inpatient request process has most recently been altered to improve patient information including clinical ordering details. We have been particularly focused in minimizing patient dose in younger patients by diverting patients where possible to non-ionizing techniques like US and MRI when possible. We are also continually working to minimize exam dose and avoiding unnecessary examinations. We have also worked hard to maximize patient flow for Emerge, IP, and OP patients.

In addition to servicing the general needs of our referring physicians we offer a number of sub-speciality programs in CT with Cardiac CT, CT enterography, CT enteroclysis and CT colonography.

We have a strong cross-sectional fellowship program that has a large image guided biopsy/drainage component.

Two radiologists, one fellow and often one resident are assigned to read CT on a daily basis. One of these scheduled radiologists has subspecialty interest in cross-sectional imaging has a specific role to supervise and teach residents and fellows. We have an expanding CT interventional program. Currently we perform 9 scheduled lung biopsies weekly with additional inpatient biopsies and drainage procedures. These are performed by a designated biopsy radiologist and biopsy fellow on Monday, Wednesday and Friday.

SJHH DI MAGNETIC RESONANCE IMAGING SERVICES:

MRI is read by 9 radiologists at St. Joseph's:

- 4 body fellowship trained radiologists
- 2 breast MRI fellowship trained radiologists
- 2 neuro fellowship trained radiologists
- 2 MSK fellowship trained radiologists

We have full collaboration between Imaging Research Centre (IRC), under direction of Dr Karen Gulenchyn, and clinical services. SJHH MR department performs approximately 14,000 exams/year.

A wide variety of examinations are performed including:

1. Neuro MRI - including MRA, functional MRI, MR spectroscopy
2. MSK - including MR arthrography, MR neurography
3. Breast - including OBSP screening of high risk woman, and breast biopsy capability
4. Body - all exams including MR enterography
5. MRA - busy vasculitis practice including several ongoing trials regarding large vessel vasculitis and MRI. First MRI department in Canada to receive ACR accreditation

The MRI department at St. Joseph's Healthcare Hamilton prides itself on delivery of efficient, high quality and patient-focused care. We have recently implemented several changes suggested by the provincial Process Improvement Program (PIP) which have helped us realize even greater efficiencies and better utilization of resources and as such, have achieved a dramatic reduction in wait times for our patients.

DEPARTMENT OF NUCLEAR MEDICINE

The city-wide Nuclear Medicine program has created significant opportunities for further sub-specialization in support of the clinical foci of the individual hospital sites.

The lead sites for the subspecialty nuclear medicine diagnostic services and treatment are:

1. McMaster - Bone & Joint, Occupational Nuclear Medicine
2. McMaster Children's - Pediatrics
3. Henderson/Juravinski - Oncology, Orthopedic Surgery
4. Hamilton General - Cardiology
5. St. Joseph's - Respirology, Nephrology

Alignment of diagnostic specialties and expertise with the clinical specialization of each site is extremely important in order to provide patient-centered care and effective and efficient support to referring clinical colleagues.

INTEGRATED RADIATION SAFETY OFFICE (IRSO)

HHS and SJHH have combined resources in the Integrated Radiation Safety Office (IRSO). This office provides corporate oversight and support to all areas at HHS and SJHH that use radiation emitting (X-Ray) equipment such as fluoroscopy, general radiography, interventional and CT equipment. The IRSO is committed to continually raise safety awareness, improve radiation safety standards, participate in decision making and consultation, provide timely and effective responses, and to create and sustain an environment inspiring trust, integrity, collaboration and personal responsibility.

A. Dosimeter Education and Compliance

In keeping with Ontario Ministry of Labour regulations (Occupational Health and Safety Act - Regulation 861) and Hospital Policy, the IRSO has implemented a process to identify all staff who will meet the OHSA definition of "X-Ray Worker". All medical specialties have been contacted with regard to whether their staff may meet this criterion. Upon identification as an X-Ray Worker a presentation on radiation safety is provided; presentation content is adjusted to ensure relevant information and examples applicable to each specialty. Residents and fellows are similarly contacted annually according to specialty and provided education. IRSO has developed e-learning education modules to address radiation safety topics for X-Ray Workers; these include dosimeter education and compliance requirements. Furthermore, to ensure all X-Ray Workers are identified IRSO has created criteria to assist individuals in determining if they are an X-Ray Worker.

Once identified as an X-Ray Worker dosimeters are issued and individuals are notified of dosimeter location and the quarterly exchange schedule (fetal dosimeters are exchanged bi-weekly). IRSO has initiated an electronic notification system with the dosimeter provider to assist in assuring that all staff are working within safe limits thereby keeping their occupational doses As Low As Reasonably Achievable (ALARA). In order to maintain ALARA doses, two investigational dose levels will be applied when reviewing quarterly radiation dosimeter badge readings. The dose levels requiring investigation are charted and a process for notifying individuals and providing radiation dose education has been established.

Dosimeter dose reports are posted in a designated spot for review by the wearer; IRSO has created and published an explanatory to assist wearers in understanding how to read their dose.

B. Lead Apron Tracking System

An electronic Apron Tracking System has been implemented across HHS sites; document was published to be used as a guideline for implementing the system. This new system allows for a more robust way of ensuring that the regulatory requirements around quality control for lead garments are adhered to across all sites by tracking inventory, condition and apron fluoroscopy testing.

C. Patient Education

Created and distributed patient/family education brochures to educate and engage patients and family members on radiation exposure due to x-ray based procedures.

D. Radiation Dose Management:

Conducted CT radiation dose audits across HHS to review and compare dose for various body parts (head, chest and kidney). Assessment lead to follow-up work which resulted in significant dose reduction in CT pediatric head, chest and abdomen scans. Conducted radiation dose study in MUMC Interventional Radiology which results in radiation dose decrease for insertion procedures.

RELATIONSHIPS & AFFILIATIONS

Relationships & Affiliations

Our radiologists are members of many national and international organizations:

CANADA HEALTH INFOWAY

CHI has partnered with us for the last 8 years in research related to the implementation of Lossy Compression for medical images, in order to achieve savings in storage and bandwidth. This is still an ongoing project with multiple cycles of funding.

CENTRE FOR PROBE DEVELOPMENT AND COMMERCIALIZATION (CPDC)

Partnership with the department of Nuclear Medicine for the production of nuclear and molecular agents.

eHEALTH AT MCMASTER UNIVERSITY – TOM DOYLE

This project will build and train an expert team to validate the current radiation knowledge and risk model and create the tools required to understand the long-term effects of low dose radiation exposure and facilitate the adoption of best practices to decrease the impact of imaging related radiation exposure.

GE HEALTHCARE

General Electric Health Systems is involved in multiple research projects with our department in a variety of fields including Molecular Imaging in assessment of breast cancer, multimodality fusion/registration of images between ultrasound and MR, portable ultrasound, advanced MR image processing.

A recent funded project has demonstrated the value of hip tomosynthesis for detection of subtle hip fractures, limiting the need for MRI.

HAMILTON HEALTH SCIENCES

Hamilton Health Sciences is a partner in most of our research projects and provides us with access to technology, patients and research ethics board.

IMAGING RESEARCH CENTRE – (IRC)

IRC, based at St Joseph Hospital Hamilton, is our leading research branch for MR applications going from probe manufacturing to software development specifically for BOLD technology. IRC is also a leading research around hybrid technology such as PET-CT.

INSTITUTO DE INFORMÁTICA, UFRGS - UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL. PORTO ALEGRE, RS, BRAZIL. – DR. JACOB SCHARCANSKI

Collaboration with the Department of Computer Sciences on such topics as automatic assessment of tumour growth and Content Based Image Retrieval in Medicine has led to international publications.

MCMASTER UNIVERSITY FACULTY OF HEALTH SCIENCES - MILO

McMaster University is our natural partner in all projects and helps us to manage all issues pertaining to Intellectual Property as well as legal writing, support for grants, financials, etc.

MEDICAL IMAGING INFORMATICS RESEARCH CENTRE AT MCMASTER - (MIIRC@M)

MIIRC@M is a research branch of the Department; jointly funded by the Faculty of Health Sciences and the VP Research at the University, it supports all activities related to the use of computers in imaging.

MOHAWK COLLEGE

Number of projects have been initiated with Mohawk on topics including ultrasound teaching and research, as well as sharing resources for our ORF ICD project. Our department provides education and training to Mohawk College students.

NATIONAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA - COLLABORATIVE RESEARCH AND DEVELOPMENT – (NSERC-CRD)

NSERC has funded a number of joint projects with University of Waterloo.

SOSCIP (IBM)

This project will build and train an expert team to validate the current radiation knowledge and risk model and create the tools required to understand the long-term effects of low dose radiation exposure and facilitate the adoption of best practices to decrease the impact of imaging related radiation exposure.

SOSCIP (IBM) has provided software for the project, and is funding two masters students for two years.

UNIVERSITY OF WATERLOO - DR. EDWARD R. VRSCAY AND DR. ZHOU WANG

Our collaboration with the Department of Applied Mathematics at University of Waterloo has resulted in a number of joint research projects such as Structural Similarity in Image Quality assessment; we have also shared resources and students, including participation in PhD supervision.

Content Based Image Retrieval – Dr. Hamid Tizoosh

STRENGTHS & WEAKNESSES

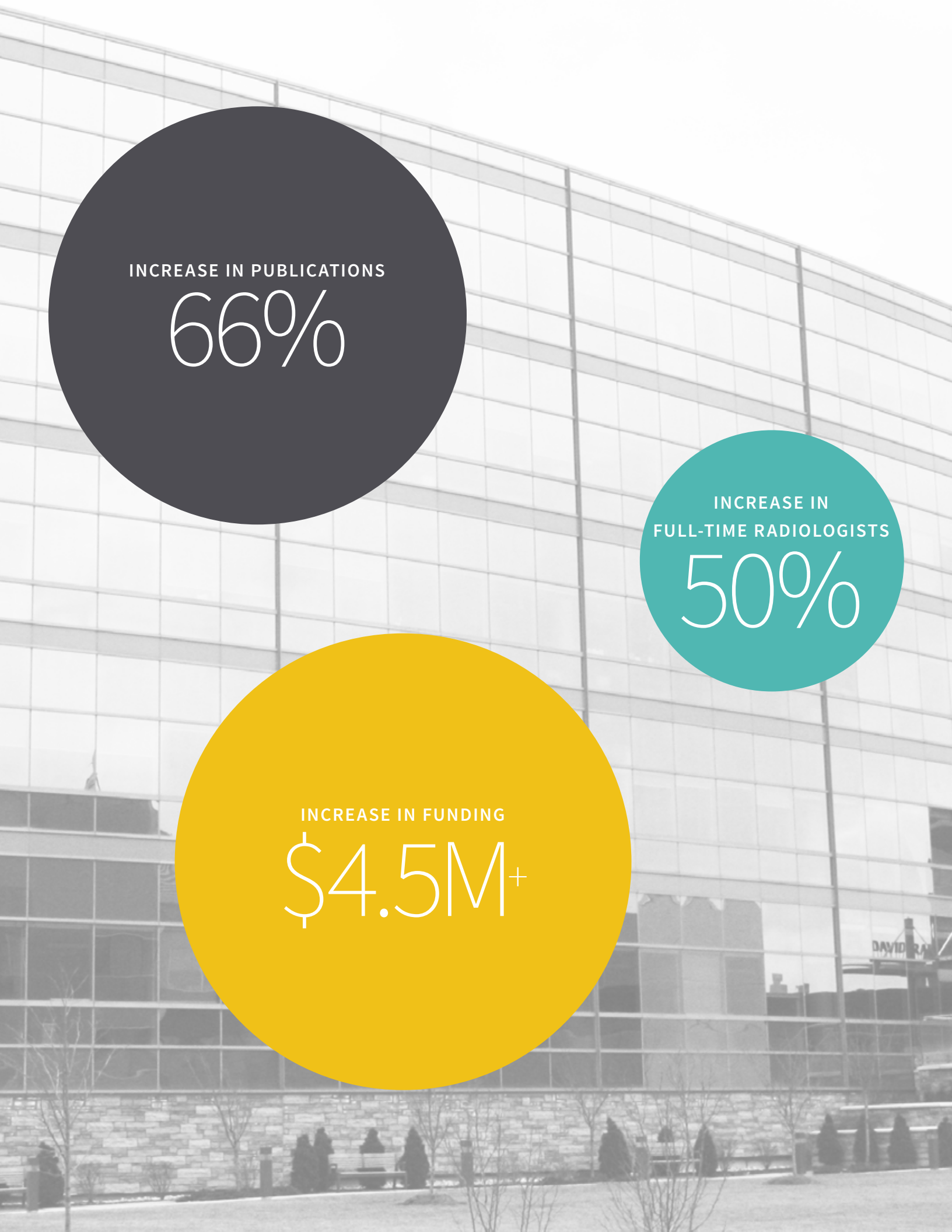
Strengths & Weaknesses

STRENGTHS

- A rejuvenated dedicated pool of radiologists, a majority full-time, who believe in their academic mission, work hard and thrive for excellence. We have also recruited some new faculty who hold Masters Degrees in Education.
- A strong commitment to education has resulted in superb achievements in our post-graduate programs with constant excellent results for our residents, one of the two best in the country.
- Sought after fellowship program and high satisfaction from our fellows.
- A new organizational structure with strong and competent administrative support, allowing for improved foundations in our program.
- Growing research with new departmental research manager, statistical support and more radiologists involved in multiple projects.

WEAKNESSES

- Chronic lack of funding, despite attempts to build sustainability, with more equipment far beyond end of life and inability to expand the technical plateau without new equipment. This may impact our ability to retain or recruit high level academic radiologists.
- Lack of operating hours and long wait time increase the clinical pressure and limit growth.
- Limited PACS system with no integration between hospital systems (hopefully to be solved in 2017); no search engine limiting research capacity.
- Lack of integration between the clinical sites with five distinct partnerships which don't share the same culture.
- Lack of funding and support for Research.


INCREASE IN PUBLICATIONS
66%
INCREASE IN
FULL-TIME RADIOLOGISTS
50%
INCREASE IN FUNDING
$4.5M+

Achievements 2012 – 2016

Over the past five years, many changes have been implemented in the Department which has had an impact on delivery of services, education, research and interpersonal relations.

- Academic Practice Plan (APP), to support the academic leaders independently from their groups. All radiologists belong to the Academic Practice Plan and contribute a tithe. The APP is managed by a financial committee.
- 50% increase of full-time academic radiologists in 5 years, now majority.
- 66% increase in publications.
- Subspecialization at all sites.
- Acclaimed Residency program which has successfully passed the Royal College review.
- Sought-after fellowship program, which attracts fellows from Canada and abroad.
- New Royal College approved neuroradiology residency program.
- New evaluation process for fellows.
- Recruitment of PhD's to improve research visibility and generate more grant money.
- Increasing amount of research funding, with more than $4.5m granted in 5 years.
- Increasing research collaboration throughout our different research poles and successful grants allowing for an increase in our research team.
- Successful recruitment of an integrated Research Manager allowing us to boost our research initiatives and participation at all sites.
- Successful succession plan for the Chair position.
- Pilot program for Peer Review evaluation.

Goals For The Coming Years

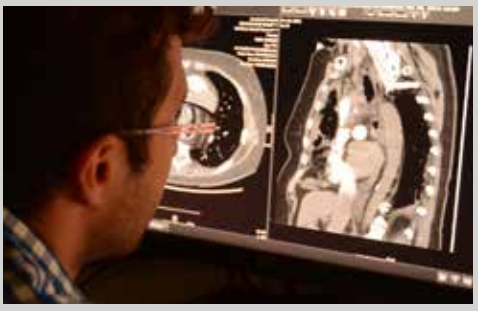
Future goals and objectives:

- Change in leadership will certainly result in a new strategy for the Department when the new Chair implements her/his vision.
- Quality will remain a priority and this includes the implementation of a mandatory prospective distributed multi-centric peer review solution, designed for education ad improvement.
- Developing leadership at all levels is required to achieve system transformation and adjust to a changing landscape in healthcare. We need to train the leaders of the future and we will see the implementation of LEADS in the residency curriculum.
- Quality and justification are the best ways to provide best results and optimize costs. We need to implement decision support tools and peer review for quality improvement and continued education.
- Research must be a priority with more support and engagement.

Quality

Leadership

Research



DEPARTMENT PUBLICATIONS

Department Publications

RADIOLOGISTS

2012

Dason S, Dilauro M, **Athreya S**. Prophylactic balloon occlusion of internal iliac arteries in women with placenta accrete: A literature review and analysis. Clin Radiol. 2012 Jun;67(6);515-20. Epub 2012 Jan 2. Review.

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