

# Status Report 2011

## RADIOLOGY



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### APPENDICES

The appendices for this status report are available electronically from the Department of Radiology website: <http://fhs.mcmaster.ca/radiology>



# Overview



# Overview

## Vision & Mission of the Department

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### 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 care to the people and communities we serve.*

*Radiology commits to advance patient care through education and research.*

## Overview

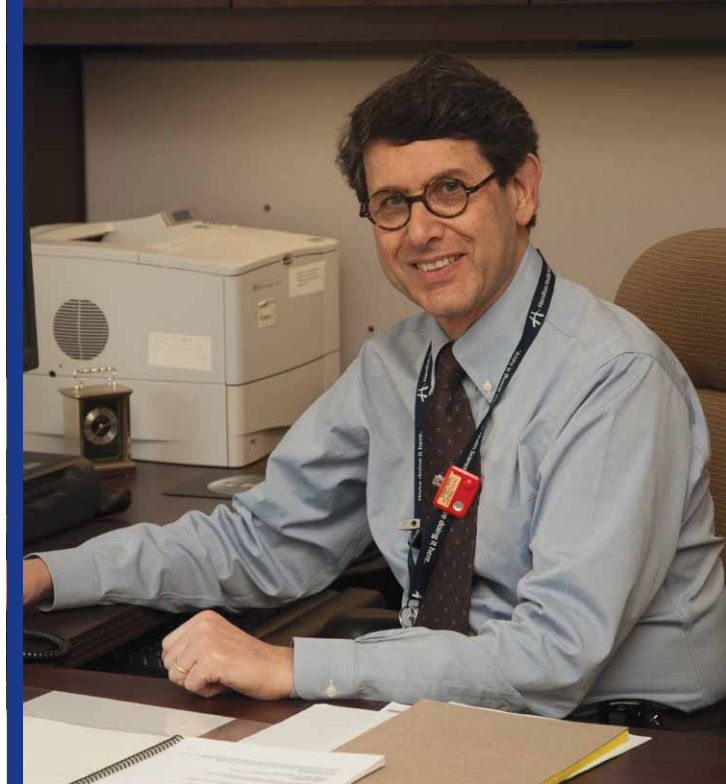
The Department of Radiology consists of faculty from a regional network of hospitals and facilities, and provides medical imaging teaching from undergraduate through to postgraduate to McMaster students. The 80 faculty members of our department, 34 of them full time, are primarily based at Hamilton Health Sciences and St Joseph's Healthcare and work in varied divisions; radiology, nuclear medicine, obstetrics & gynecology, and medical physics. The department also has several adjunct members who are based in the Niagara Health Systems, Guelph and the Kitchener-Waterloo area.

Radiology at McMaster University has seen immense growth thanks to the dedication and hard work of the members of the Department, and is on track to achieve excellence in education. I am proud to report the achievements of the past three years.

An external review of the department was performed in 2003 and it identified some weaknesses in the academic program such as poor communication, lack of support from the Chair, lack of research activity, scattered structure split between the 4 hospitals and not enough support for education and academic involvement.

Over the past 3 years, we have worked to change the structure of the department in order to reach the level of quality and accountability expected in a prestigious academic institution. We are proud to be recognized as one of the top two residency programs in Canada and we have a highly sought after fellowship program with applicants coming from across Canada and all over the world. Our radiologists spend hundreds of hours teaching our undergraduate students, and we have increased our research profile with more grants and more leading edge projects.

**We have implemented numerous organizational changes** which have resulted in a renewed interest for the academic mission and achieved engagement from newly motivated faculty at all sites. Opinions expressed during the annual review process confirm that faculty members are no longer feeling excluded and the general consensus is that the Chair reaches out to all through multiple channels of communication.



These organizational changes have resulted in:

- The creation of a new advisory structure, the Department of Radiology Academic Council (DRAC), is designed to support the Chair and consists of the different program directors and the clinical leads at each site.
- A rejuvenation of the DEC role with new terms of reference and updated goals and objectives.
- A stronger Tenure and Promotion committee.
- A new Research Committee constituted of individuals with a strong and recognized track record in research.
- A new Continuing Education committee to promote and support professional development in and outside of our Department.
- New key roles within our department; undergraduate and fellowship program directors with new terms of reference and defined goals and objectives.

One way we have worked to improve communication in the department is the implementation of an individual Annual Review. This has been positively received by our faculty as it allows for review of goals and performances and has introduced one on one communication with their Chair. Other channels of communication recently implemented include a successful monthly newsletter and a more comprehensive, informative website.

## THE DEPARTMENT OF RADIOLOGY HAS SEVERAL SUCCESSFUL EDUCATION PROGRAMS;

In our Undergraduate program, under the supervision of the DEC and a new motivated Undergraduate Program Director, our radiologists participate actively and willingly in the medical foundations resulting in overall excellent evaluations. They also regularly train elective students at all of our sites.

Our Residency program has 32 residents in the 5 years program, distributed between our 4 hospitals. The program has expanded during the current program director's tenure and has gained recognition as a strong, competitive Canadian training program with an established track record of graduating well-trained residents, success at certification examinations and recruitment of McMaster graduates to top-notch fellowship programs. The last Royal College survey, in 2009, resulted in Full Approval with no weakness identified. The strengths of our program are a dedicated, dynamic, outstanding and well-respected program director with sufficient protected time and support, a strong academic program with excellent participation of the faculty, a successful implementation of the CanMEDs competencies, and a well-structured mentorship program.

The Radiology Fellowship program has 12 funded positions. Our program is one of the largest in Canada offering postgraduate training across four sites at HHS and St Joseph. It is a comprehensive educational experience that attracts Fellowship applicants from North America and abroad. The selection and recruitment has been standardized and we are in the process of creating a new Royal College accredited neuroradiology fellowship.

Our department has expanded its research activities through 3 vibrant poles of research in MRI, Molecular Imaging and Medical Imaging Informatics. In addition, numerous faculty members pursue research in collaboration with other clinical departments.

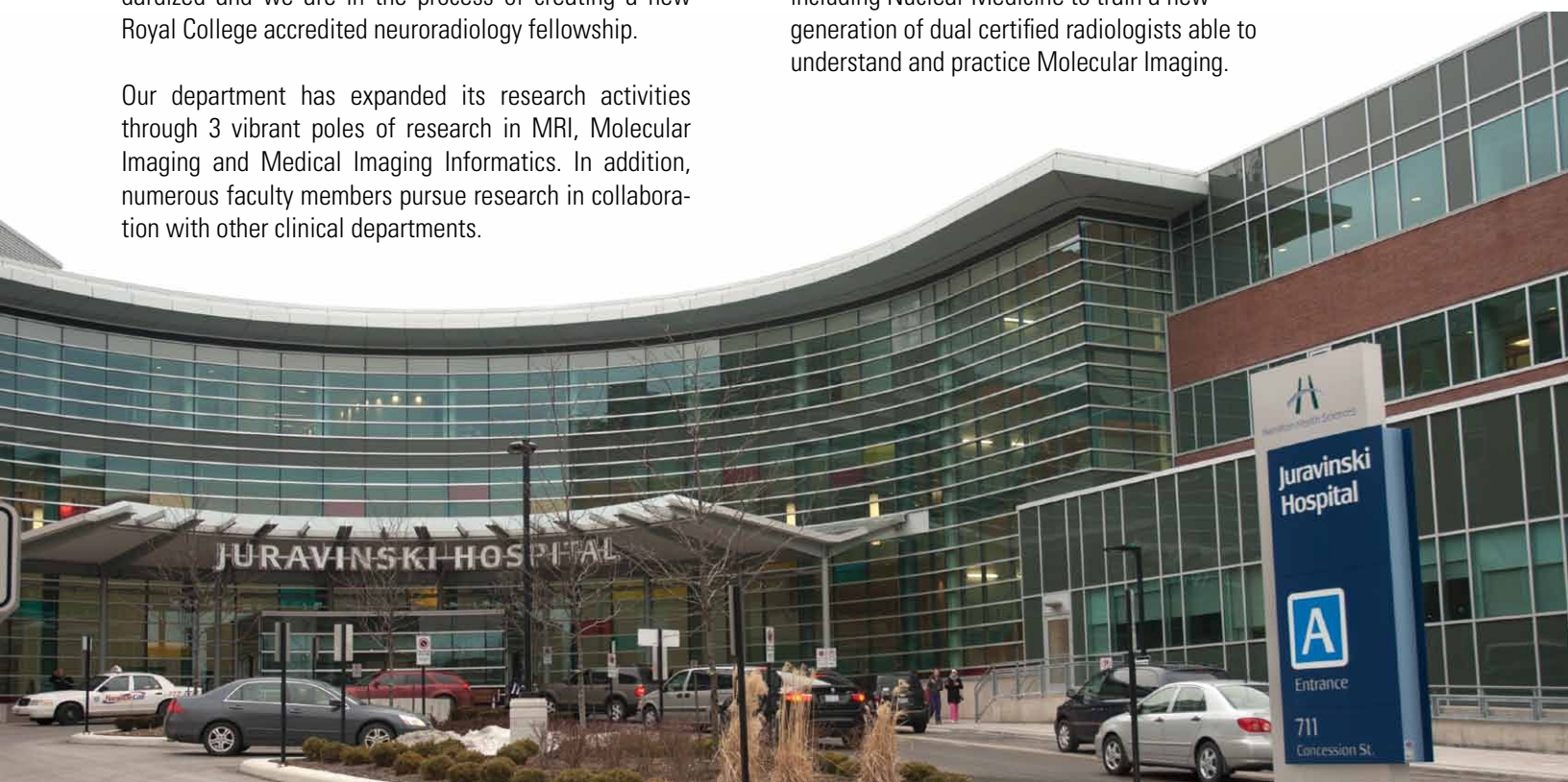
## Challenges and opportunities

- The Residency Program Director is stepping down after 11 years; succession plan in place.
- Lack of integration between the groups; improving through implementation of subspecialized divisions and integrated calls.
- Lack of support for education and research: need to create solidarity between the groups and identify new sources of financing.

## Future goals and objectives

There is more to do to improve overall performance, and to provide better support to educational and research activities. Our plan for the coming years is to:

- Create an **Academic Practice Plan** to unite all members of the Department under a common structure with agreed upon Service Agreement, in order to support the academic activities in equalizing the contribution from all physicians working in the Department, and ultimately join the AFP.
- Implement a new **evaluation scorecard** to include all academic, research and clinical contributions. This evaluation will be updated each year for the annual review.
- Achieve **sub specialization** already under way to further improve quality of teaching and excellence in clinical delivery.
- Prepare for imaging of the future and develop a new **combined residency** program including Nuclear Medicine to train a new generation of dual certified radiologists able to understand and practice Molecular Imaging.



# The Organization & Physical Structure





# The Organization & Physical Structure

## Administrative Organization and Management

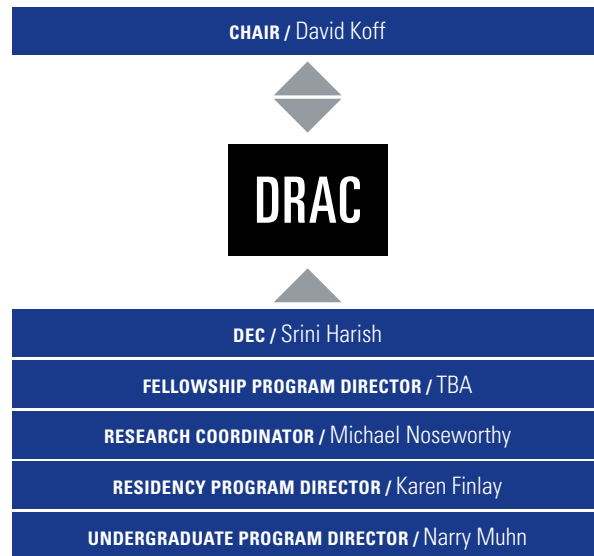
The Department Chair is ultimately responsible to the Dean/Vice President and provides leadership in all aspects of Departmental affairs.

When I took office as new Chair, I implemented significant changes in the Governance structure and created new committees to support the new vision for the Department and manage our key activities. (see Chart # 1 below)

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

The Department of Radiology Academic Council 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 advice on other matters of importance to the department.

CHART 1 / GOVERNANCE



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

Four (4) committees report to the DRAC: (see Chart # 2)

CHART 2 / ORGANIZATIONAL STRUCTURE



## Tenure and 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 this 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

## Continuing Medical Education Committee (CMEC)

The mandate of the new 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 new 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 resulting newly revised committee shall be made of: Michael Noseworthy, Chair, Dr. David Koff, and 5 or 6 others. The additional members will be chosen based on their research activities.

### A NEW GOVERNANCE STRUCTURE FOR THE CLINICAL DEPARTMENT

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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 7 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.

### CHART # 3

SUBSPECIALTY	DIVISION HEAD
Body Imaging	Dr Tsai
Breast	Dr Minuk
Chest	TBA
Musculoskeletal	Dr Jurriaans
Neuroradiology	Dr Franchetto/Dr Mensinkai
Pediatrics	Dr Stein
Vascular Interventional	Dr Yip
Vascular Interventional	Dr Yip

The implementation of subspecialty divisions at Hamilton Health Sciences has already started to generate significant results with an integrated Interventional Radiology program at HHS where radiologists rotate at all sites and have an integrated call roster. Negotiations have been initiated for SJH to join the group.

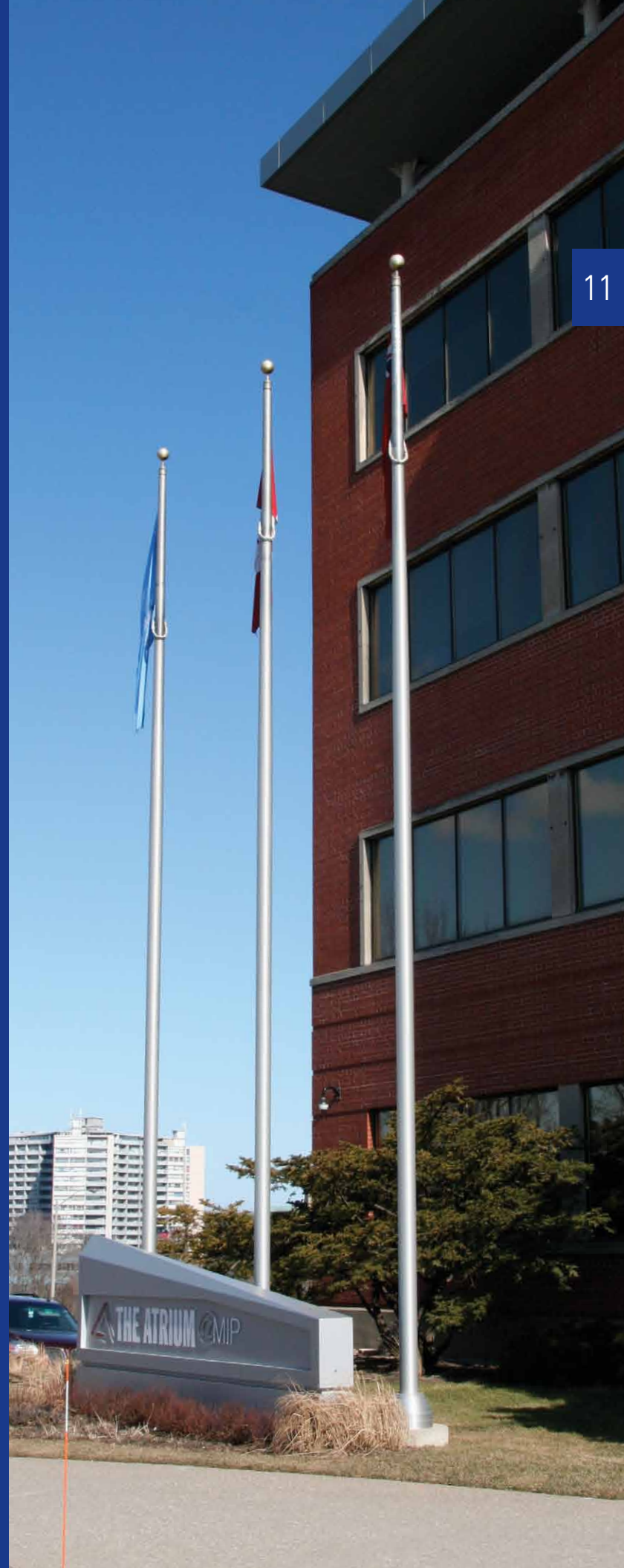
Subspecialty coverage is now almost appropriately staffed at all sites thanks to the recruitment of fellowship trained radiologists over the past years. The next step will be to extend the subspecialty leadership to all the sites, including St Joseph Hospital, in order to ensure a continuous subspecialty 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 Manager, Sue Gaudet, seconded by two administrative assistants: Marilynn Scott for the Departmental Education Coordinator, Undergraduate and Fellowship Program Directors and Trish Van Sickle for the Residency Program Director.

The department website is maintained by Jordan Hagel.

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## Physical Structure

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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 one of Canada's most innovative Digestive Diseases programs, as well as the nationally recognized McMaster Children's Hospital. In addition, MUMC delivers a wide range of Women's Health services, including high-risk Obstetrics and Gynecology. Currently, major redevelopment is occurring at MUMC to nearly 20 percent of the existing site (approximately 125,000 net square feet). The centre is being 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 8 full and part-time radiology faculty, as well as several faculty members cross-appointed from Obstetrics and Gynecology. Fellowship trained faculty expertise includes chest, body, interventional, musculoskeletal, neuroradiology and obstetrical imaging. 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.

**Juravinski Hospital**, formerly known as the Henderson Hospital, is the region's center of excellence for cancer and orthopedic care. Over the next few years, nearly three quarters of the existing hospital (approximately 425,000 square feet) will be redeveloped to accom-



modate upgraded services for the Juravinski Cancer Centre (JCC), the hospital's large Arthroplasty Program and general hospital services. With this redevelopment, the Juravinski Hospital will further expand its highly regarded orthopedic program. It will continue to service the JCC, which represents the most comprehensive cancer care and research facility in the Central South/Central West region. The JCC is close to completing a large expansion, making it 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 16 full and part-time radiology faculty. In August 2010, we moved into a new facility with upgraded equipment. The entire hospital redevelopment is expected to be completed in 2012. This offers exciting imaging opportunities, with a new 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, 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 16 full and part time radiologists, with subspecialty expertise in neuro-radiology, 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, one 1.5T

MRI, a full ultrasound department, and three interventional suites. We are fully PACS operational and utilize voice recognition dictation software. A second 1.5T MRI will be installed in the coming weeks.

**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 services the above programs. We have recently moved into a brand new hospital wing, shown in the picture below. 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 Street 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. Catharines, Waterloo and Niagara Health 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 at the Chedoke site, in the Patterson Building.

## Inter Department Communication

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### 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. A survey performed at the beginning of 2011 showed a high satisfaction index from readers.

## 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/>

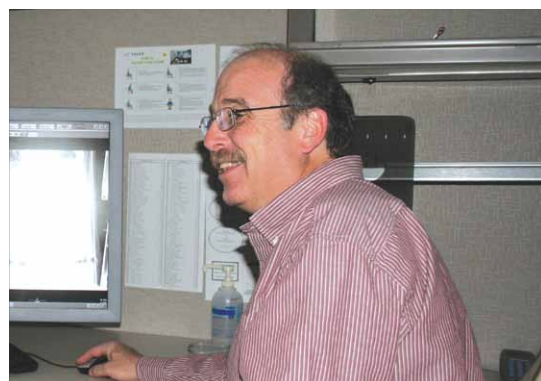
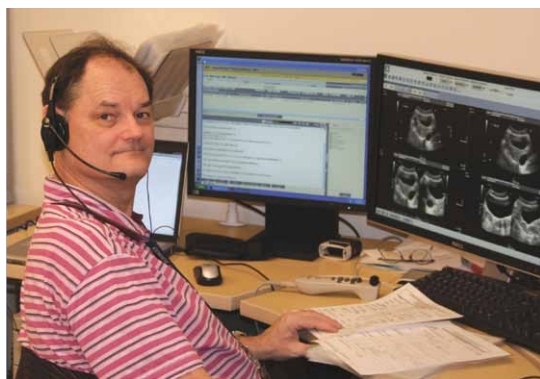
## Annual Academic Get Together

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 de 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

## Faculty

Please note that all of our faculty are Clinician Educators

### Hamilton General Hospital

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Birchenough, Brian	2008	Clin Assist	PT	Body, Neuro	Yes
Chiavaras, Meg	2010	Assistant	FT	MSK	Yes
Choudur, Hema	2005	Associate	FT	MSK	Yes
Doris, Ian	1988	Clin Assoc	PT	General, US	No
Ellins, Mary L.	1999	Clin Assist	PT	Neuro	Yes
Franchetto, Arlene	1985	Clin Assoc	PT	Neuro	Yes
Gastaldo, Fernando	2008	Assistant	FT	VIR	Yes
Landry, David	2008	Clin Assist	PT	General	No
Larrazabal, Ramiro	2005	Assistant	FT	Neuro	Yes
Lee, Richard	2005	Clin Assoc	PT	General	No
Mensinkai, Arun	2010	Clin Assist	PT	Neuro	Yes
Patlas, Michael	2004	Associate	FT	Body, Breast	Yes
Ribeiro, Luciana	2011	Assistant	FT	Neuro	Yes
Romeo, Michael	1982	Clin Assoc	PT	General, MSK	N/A
Vu, Manh	2001	Clin Assist	PT	General, MSK	No
Yip, Gordon	2002	Clin Assist	PT	VIR	Yes

### Juravinski Hospital & Cancer Care

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Chou, Sheila	2002	Clin Assist	PT	VIR	Yes
Dhamanaskar, Kavita	2005	Associate	FT	Body, Breast	Yes
Elder, Janice	1999	Clin Assist	PT	General	N/A
Ferri, Melanie	2009	Clin Assist	PT	Cross-sectional	Yes
Finlay, Karen	1999	Associate	FT	MSK	Yes
Griffiths, Melanie	2005	Assistant	FT	General	No
Jurriaans, Erik	1996	Associate	FT	MSK	Yes
Markose, George	2011	Assistant	FT	VIR	Yes
Minuk, Terry	1984	Clin Assoc	PT	Breast	N/A
Parasu, Naveen	2007	Assistant	FT	MSK	Yes
Stewart, Lori	2002	Clin Assist	PT	Body	Yes
Thomson, Andrea	2010	Clin Assist	PT	Body, Breast	Yes
Thomson, Graham	1987	Clin Assoc	PT	General	N/A
Tsai, Scott	2008	Clin Assist	PT	Body	Yes
Wat, Josephine	2008	Assistant	FT	Body, PET	Yes
Yemen, Brian	1989	Clin Assist	PT	Body, Neuro	No

## McMaster Children's Hospital

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Coblentz, Craig	1988	Professor	FT	Chest	Yes
Maizlin, Zeev	2007	Associate	FT	MSK, Body	Yes
Mernagh, John	1996	Associate	FT	Body, US	Yes
Midia, Mehran	2003	Associate	FT	VIR, neuro	Yes
Otero, Carmen	2003	Associate	FT	Chest	Yes
Singh, Nina	2004	Clin Assist	PT	Body	Yes
Stein, Nina	2011	Assistant	FT	Pediatrics	Yes
Vora, Parag	2006	Associate	FT	VIR, GI	Yes

## St. Joseph's Healthcare

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Athreya, Sriharsha	2008	Assistant	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
Dobranowski, Julian	1988	Clin Assoc	PT	MRI	Yes
Franic, Slobodan	1990	Clin Assoc	PT	Breast	N/A
Haider, Ehsan	2008	Clin Assist	PT	Body	Yes
Harish, Srinivasan	2006	Associate	FT	MSK	Yes
Kwok-Liu, Josephine	1981	Clin Assist	PT	Body, Breast	
Munh, Narry	2009	Clin Assist	PT	women's imaging	Yes
O'Neill, John	2003	Associate	FT	MSK	Yes
Rebello, Ryan	2006	Associate	FT	Body	Yes
Schiff, David	1982	Clin Assoc	PT	VIR	N/A
So, Genhee	2008	Clin Assist	PT	Body, Interventional	Yes
Voss, Maurice	2003	Clin Assist	PT	VIR	Yes
Woods, David	1985	Clin Assist	PT	VIR	N/A

## Nuclear Medicine

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	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 Assistant	PT		
Webber, Colin	1975	Clin Assistant	PT		
Singnurkar, Amit	2009	Assistant	FT		

### Medical Physics

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Farrell, Tom	1995	Associate	FT		
Hayward, Joseph	2003	Associate	FT		
Patterson, Mike	1990	Professor	FT		
Wyman, Doug	1986	Associate	FT		

### Researchers

NAME	START YEAR	RANK	APT CATEGORY	SPECIALTY	FELLOWSHIP TRAINED
Matos, Andre	2011	Clin Assist	PT		
Bak, Peter	2010	Clin Assist	PT		
Noseworthy, Michael	2003	Associate	FT		
Gordon, Chris	2000	Clin Assist	PT		
Moran, Gerald	2001	Associate	PT		
Tshibwabwa, Eli	2003	Assistant	PT		

### 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. CatharinesGeneral
Ghookal, Dharmendr	2009	Adjunct	PT	Waterloo
Mehta, Amit	2011	Adjunct	PT	Niagara Health
Patel, Samir	2011	Adjunct	PT	Guelph
Plaskos, Nick	2011	Adjunct	PT	Guelph
Popuri, Ramu	2010	Adjunct	PT	Cambridge

### Summary

	HGH	JH&CC	MUMC	SJH	NUC MED	MED PHYSICS	RESEARCHERS	ADJUNCT	TOTAL
FT	6	7	7	7	2	4	1	0	34
PT	10	9	1	9	4	0	5	8	46

### Faculty: Age Distribution

	25-30	31-35	36-40	41-45	46-50	51-55	56-60	61-64	65+
Female		2	5	3	5	1	4	1	
Male		4	13	16	7	7	5	3	4

## Promotion and Tenure

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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 2008;

NAME	PROMOTION YEAR	PROMOTION RANK
Otero, Carmen	2008	Associate with CAWAR
Finlay, Karen	2009	Associate with CAWAR
Hayward, Joseph	2009	Associate with CAWAR
Midia, Mehran	2009	Associate with CAWAR
O'Neill, John	2009	Associate with CAWAR
Patlas, Michael	2009	Associate with CAWAR
Dhamanaskar, Kavita	2010	Associate with CAWAR
Farncombe, Troy	2010	Associate with CAWAR
Boylan, Colm	2011	Associate with CAWAR
Choudur, Hema	2011	Associate with CAWAR
Coret, Andu	2011	Associate with CAWAR
Coret-Simon, Judith	2011	Associate with CAWAR
Harish, Srinivasan	2011	Associate with CAWAR
Rebello, Ryan	2011	Associate with CAWAR
Vora, Parag	2011	Associate with CAWAR
Larrazabal, Ramiro	2012	Associate with CAWAR
Parasu, Naveen	2012	Associate with CAWAR

## Awards and Honors

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### 2008

#### FACULTY

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- Dr C. Coblenz: Excellence in Clinical Teaching (Department)
- **Dr K. Finlay: RSNA Award of Merit**

#### RESIDENTS

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- **Dr R. Mittal: RSNA Resident Research Award**
- Dr N. Muhn: Resident Teacher and Mentorship Award

### 2009

#### FACULTY

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- **Dr M. Patlas: Young Investigator Award - Canadian Association of Radiologists**
- Dr A. Franchetto: Dr. H.O. Stolberg Memorial Award of Excellence
- Dr T. Minuk: Excellence in Clinical Teaching

#### RESIDENTS

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- **Dr V. Venkatesh: RSNA Resident Research Award**
- Dr S. Patel: Resident Teacher and Mentorship Award

### 2010

#### FACULTY

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- **Dr K. Finlay: Canadian Association of Medical Education (CAME) – Certificate of Merit Award**
- Dr R. Rebello: Excellence in Clinical Teaching
- Dr K. Finlay: Top 5 exceptional abstracts, International Conference on Residency Education, Ottawa.

#### RESIDENTS

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- Dr M. Colapinto: Resident Teacher and Mentorship Award
- **Dr B. Stewart: RSNA Resident Research Award**

### 2011

#### FACULTY

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- **Dr K. Finlay: McMaster University President's Award for Educational Leadership**
- Dr K. Finlay: Top 5 exceptional abstracts, International Conference on Residency Education, Quebec City.
- Dr K. Gulenchyn: Academic Radiologist of the Year
- Dr M. Patlas: Medical Staff Association President's Award for Distinguished Service

- Dr J. Elder: Excellence in Clinical Teaching
- Dr C Coblenz: Best Rounds
- Dr E. Haider: Best Academic Half-Day Teaching
- Dr T. Minuk: Best Teaching on a Rotation - Breast at Juravinski Hospital
- Dr C. Otero: Recognitions for exemplary undergraduate Teaching.
- Dr J. Coret-Simon: Recognitions for exemplary undergraduate teaching.
- Dr. Sat Somers: (Radiology Editor's Recognition Award for Reviewing with distinction". From RSNA in recognition of outstanding service as a reviewer of scientific manuscripts submitted for publication in Radiology.

#### RESIDENTS

- **Dr S. Bhan: Physicians' Services Incorporated Foundation Resident Prize**
- **Dr D. Linda: RSNA Resident Research Award**
- Dr B. Stewart: Resident Teacher and Mentorship Award

## Recruitments and Departures

Our recruitment needs have been historically determined by the hospitals' clinical requirements. Going forward the strategy is 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 2008.

NAME	START YR.	RANK	APT CATEGORY
Athreya, Srihrsha	2008	Assistant	FT
Gastaldo, Fernando	2008	Assistant	FT
Haider, Ehsan	2008	Clin Assistant	PT
Landry, David	2008	Clin Assistant	PT
So, Genhee	2008	Clin Assistant	PT
Tsai, Scott	2008	Clin Assistant	PT
Wat, Josephine	2008	Assistant	FT
Arvinte, Andre	2009	Adjunct	PT
Cheng, Gordon	2009	Adjunct	PT
Ferri, Melanie	2009	Clin Assistant	PT
Ghookal, Dharmendr	2009	Adjunct	PT
Munh, Narry	2009	Clin Assistant	PT
Singnurkar, Amit	2009	Assistant	FT
Abrams, Mitchell	2010	Adjunct	PT
Bak, Peter	2010	Assistant	PT
Chiavaras, Meg	2010	Assistant	FT
Mensinkai, Arun	2010	Clin Assistant	PT
Popuri, Ramu	2010	Adjunct	PT
Thomson, Andrea	2010	Clin Assistant	PT
Markose, George	2011	Assistant	FT
Mehta, Amit	2011	Adjunct	FT
Patel, Samir	2011	Adjunct	PT
Plaskos, Nick	2011	Adjunct	PT
Ribeiro, Luciana	2011	Assistant	FT
Stein, Nina	2011	Assistant	FT

Recruits are pending in pediatrics and cross-sectional/general radiology at this time.

Listed below are the faculty departures since 2008.

NAME	START YR.	RANK	APT CATEGORY
Popuri, Ramu (resigned)	2008	Assistant	FT
Torbiak, Raymond	2009	Clin Assistant	PT
Miller, Elka (resigned)	2009	Assistant	FT
Gibson, Paul (resigned)	2009	Assistant	FT
Anderson, Mike (resigned)	2011	Assistant	FT
Kirby, John (resigned)	2011	Assistant	FT

## Staff

The Department currently has on staff one Administrative Coordinator and one Administrative Assistant, both of whom are CAW 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.

SOURCE	AMOUNT
Operating Allocation	157157
MD lead/Teaching	50779
MD Expansion	48340
PG Expansion	173863
Grad Expansion	1137
<b>TOTAL</b>	<b>431276</b>

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.

We have had carry forward balances which we have been drawing down to support focused academic strategies.

Strategic investments of the academic mission have included:

*Videoconferencing equipment was purchased for the sites to assist in increasing participation in our grand rounds as well as other departmental educational events.*

*Research was supported through a transfer to Medical Imaging Informatics Research Centre at McMaster (MIIRCAM). These funds have been used to set up the research offices, obtain some staffing, and assist faculty with research endeavors.*

*Financial support of the radiology fellowship program of \$120,000 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 a newly formed 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. As some of these events are relatively new it will take a couple of years for them to not only break even but generate some income which can go back into the educational account to further support additional activities. 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 (new research centre and new 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

## Department Education Coordinator

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**Dr. S. Harish**

The Department Education Coordinator works in conjunction with the Chair of the Department, the Residency Program Director, Undergraduate Program Director and the Fellowship Program Director in promoting the educational activities of the department. One of the primary duties of the DEC is to assist the Chair in the tenure and promotion process, particularly for full time faculty. Other activities include recognition of faculty involved in outstanding educational and academic activities in the department. Introduction of new faculty to educational activities available in the department is important. Constant liaison with the residency, undergraduate and fellowship program directors happens to ensure that these programs run smoothly with adequate processes in place for evaluation of faculty learners. There is also an active role in making the McMaster Radiology website a useful tool for anyone wishing to gain information about the academic activities in the department.

### MEETING WITH NEW FULL-TIME FACULTY IN THE DEPARTMENT

One of the primary roles of the DEC is to introduce new full-time Assistant Professor to educational activities of the department. Previously, there has been feedback about the paucity of information available to the full-time faculty in helping them in the promotion process. A process has been put in place wherein the DEC meets with the full-time assistant professor within the first few months of their appointment. The DEC goes over the various educational opportunities available within the department for the full-time faculty. This includes opportunity in residency teaching outside of the routine view-box teaching such as half-day talks, mock orals and learning tutorials to undergraduates is emphasized to new faculty. Emphasis is given to maintaining up-to-date CV (including in the STAR format) during these sessions. The importance of documenting all educational activities leading up to the promotion process is emphasized. The importance given to presentations, publications and any research/educational grant funding won in the promotion process is explained. There has been good feedback to these meetings as the new faculty members feel more reassured of what the academic expectations are following appointment.

### MEETING WITH FACULTY GOING FOR PROMOTION

In the year preceding their promotion, the DEC meets up with the candidates going for promotion. The CV is reviewed as well as the educational and clinical dossiers that are available. If educational or clinical dossiers have not been prepared, it is emphasized in the meeting to prepare one, and examples of properly-completed dossiers are shown. If there are areas where the CV or dossiers can be improved in that year, these are also put forward to the candidate so as to earn more educational points. The process of how the promotion happens including approximate time lines is provided to the candidate during these

meetings. The candidate is given opportunity to clarify any questions with regard to preparing the CV, dossiers or the personal statement. This process of meeting with the candidate has received good feedback as it alleviates the faculty's anxiety with preparation of these documents. In terms of preparing the STAR CV, the department has organized workshops at all four sites in the city with training provided to administrative assistants in helping faculty construct the CV in STAR format.

### ORGANIZATION OF CREDITS FOR EDUCATIONAL ACTIVITIES WITHIN THE DEPARTMENT

Since last year, the DEC and the residency program director have worked on updating the credits available for various educational activities in the department. While the undergraduate educational activities are automatically credited by the MD program, roles performed by the faculty with respect to residency education and fellowship education as well as administrative activities in the department have not been documented/credited adequately. The personnel involved listed all possible academic activities that could be performed by the faculty within the department of radiology. This includes roles for residency teaching, fellowship teaching, mock orals, resident half-day talk, any publications and presentation as well as administrative roles. Comparisons were made with similar activities performed in other departments. Specific credits/hours were given for each of the academic activities performed. This is a work in progress, nearing completion. Hopefully, the faculty will be credited for their educational activities for majority of their work. Some of the activities would need input from the faculty to update on the database. The idea is to be able to produce a table at the end of each academic year giving quantitative data on the academic contributions made by each faculty member. This will hopefully help the full-time and part-time faculty to have records of their respective educational contributions as expected by the University.



### DEPARTMENT AWARDS & RECOGNITIONS

The only faculty recognition that was available until last year was the best Teacher Award for the Residency Program. The need for more recognition was realized, as members of the faculty were contributing in other areas of the academic program including fellowship and undergraduate teaching as well as research and other educational academic activities (like posters and invited talks). One of the first awards introduced was the "Academic Radiologist of the Year" which is to recognize the individual with the highest contributions in research, publications, grant money and talks. Other awards introduced in the Residency Program included – Best half-Day teaching, best Rotation and best Rounds. These awards were given at the Annual Resident's Graduation Dinner held in June, 2011. Efforts are also being made to establish an award for the Best Fellowship Teacher. Although not a formal award, recognitions are also made to radiologists with exemplary undergraduate contributions. The introduction of these awards and recognitions has been well received. It is hoped that these awards/recognitions will act as an incentive to the faculty to strive for excellence in their academic activities.

### McMASTER RADIOLOGY WEBSITE

Work has been performed over the past year to update <http://www.fhs.mcmaster.ca/radiology/> (the department of radiology official website). The website is an important means of communicating to faculty and learners about the department. As well, it is also an important method by which faculty and learners know about the structure of the department as well as the ongoing academic activities. This is a work in progress. The section on the residency program is usually up to date. The research section has been updated by the research coordinator including information on timelines for applying for small grants available within the department. The process by which these grants are provided is also available on the website. Discussions are on with the department of medicine to see if a system similar to theirs (ETA) could be implemented on the radiology website as a "one-stop shop" for faculty to know what program is happening in the department. This would include things like the grand rounds, city-wide rounds, visiting professor talks,

etc. More information has been updated in the website with regard to the faculty biography. This includes photographs and information on clinical and research expertise in addition to information on the training backgrounds. This will direct faculty and learners to the correct person for opportunities to work or train. The fellowship section of the website is also being updated. All the committees within the department, their respective membership and terms of reference have been uploaded to the website. All awards and recognitions in the department will also be put on the website. The trainee and faculty publication list will also be updated. The idea is to make the website current, up to date and user friendly.

### ADJUNCT FACULTY

The residency program is now sending residents to have a month of community experience during PGY4 or PGY5. To facilitate this, radiologists in hospitals such as in Guelph or Cambridge were/are encouraged to enroll as adjunct assistant clinical professors in the department. The benefits of enrolling as adjunct faculty were made aware to these radiologists. Hopefully, this should encourage more radiologists in the community to take radiology residents for appropriate rotations. Moving forward, the idea is to bring more community radiologists to participate in as many academic programs of the department as time permits.

### FINAL NOTES

There are challenges in implementing some of the educational activities in the department. For example, remuneration for performance of the educational activities including that of the DEC, Resident Program Director, are not equally shared among the entire faculty. The bulk of the time for these activities is provided by the respective sites from which these administrators are chosen. There has also been difficulty faced by faculty in finding time to provide educational support to the undergraduate department as there is a general feeling in the department that this should be performed by the faculty outside of the working hours. This is not always possible given faculty members with families have very little time to contribute in this regard. Also, participation in research is somewhat limited by diagnostic radiology staff. However, I realize that sitting as a member of the Faculty of Health Sciences Department Educational Coordinators committee, that the

department of radiology is not alone in these challenges. These are themes that run across departments. More work needs to be done in the future in the development of robust tools for faculty evaluation, identifying resources and developing skills in education and research and to find more time for faculty to indulge in faculty-developmental activities within the university. Finally, I would like to acknowledge the efforts of the members of the department of radiology academic council, ie. Dr. David Koff (Chair) and Dr. Karen Finlay (Residency Program Director) who continue to move the mission of excellence in education forward. Also, thanks to the administrative coordinators in the Chair's office.

## Undergraduate Education



**Dr. N. Muhn**

Prior to February 2011 we did not have an Undergraduate Program Director in the Department of Radiology. Dr. Narry Muhn took on this role this year and is working to create a solid foundation for the future radiology curriculum. The goal is to provide a firm foundation in the core essentials of radiology.

A detailed review of the prior radiology curriculum will be completed to assist with the formation of an improved program going forward. There will also be a review and comparison of the major curricula in North America and Europe.

A new curriculum to be developed based on core radiology topics;

*Physics concepts: important to clinicians, radiation safety, imaging in pregnancy and complications of radiology.*

*Organ based curriculum: to include chest, musculoskeletal, neuroimaging, pediatrics, women's imaging, gastrointestinal, nuclear medicine, emergency radiology and interventional radiology.*

Dr. Muhn will be working with Dr. Bruce Wainman, Director of Anatomy Education Program, to acquire new radiological images to replace previous outdated images.

She will review the anatomy resources which are available through medportal and ensure that the e-anatomy module is included as an educational tool. This contains a large amount of radiological content which is an extremely important component in the teaching of anatomy

Our goal is to centralize and standardize our electives. The elective program is the point of utmost radiology access for the medical student, taking them out of the classroom environment and exposing them to the vastness of diagnostic imaging. Dr. Muhn will meet with each of the site coordinators for undergraduate electives in order to understand their vision for the medical students.

Currently integration of radiology foundation and medical foundation is limited. A dialogue with all key players in RF and MF is necessary to understand the needs and to promote the integration of diagnostic imaging.

## EDUCATIONAL ACTIVITIES

## Postgraduate Medical Education

### RESIDENCY



Dr K. Finlay

### PROGRAM BACKGROUND

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 expanded over the course of current program director tenure and 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 recruit-

ment 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. They dearly 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 April 2001. A day of protected administrative time is provided by the partnership group of the program director. Although the financial burden for this has not been shared with the other professional practices in radiology at McMaster, it has been provided steadily by the Henderson Radiology Group for 11 years. There is well-established administrative support for the program, in the form of a designated Program Assistant, currently Trish Van Sickle.

### 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, 7 - PGY 2, 7 - PGY 3, 7 - PGY 2, 6 - PGY 1. Residents are recruited to our program 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 recruiting highly ranked resident candidates. The combination of 5 CMG and 1 IMG makes up the usual intake of 6 residents per year. We have accepted a few additional residents through the transfer process. Commencing in 2011 our intake will expand by 1 CMG position to 6, with the 1 IMG position continuing, increasing the intake to 7 residents per year. This increase is advocated by the Postgraduate Medical Education office at McMaster, as part of the Ontario Ministry program expansion of CaRMS positions for specialties. Although historically we have taken residents through the provincial physician Re-entry Program for specialists and family physicians wishing to retrain in radiology, we have not had room to accept these candidates over the last 5 years, due to expansion of the IMG program. Similarly, we no longer accept externally funded Gulf State residents, or their equivalent.

### CURRICULUM

The first basic clinical training year consists of rotations in general surgery, internal medicine, emergency medicine, obstetrics and gynecology, pediatrics, orthopedic surgery, general pathology, radiation oncology and anatomy/ultrasound. This program design has been in place for close to 10 years. The PGY 2-5 years are structured to rotate residents through all the subspecialty areas, as outlined in Royal College requirements. Recent changes in training requirements outlined by the Royal College have prompted some changes in our rotations at McMaster University, including a dedicated second month in Obstetrical and Fetal ultrasound imaging. 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 April. 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 quiz cases 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. Faculty are responsive and engaged in the half-day education delivery process.

#### RESIDENT EDUCATIONAL SUPPORT

Our residents receive additional 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 \$1000.00 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. For those residents planning on sitting the American Board of Radiology examination, the program will sponsor their attendance at a 3-day physics course at the University of Ottawa, taught by a renowned imaging physics educator. 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. Residents are able to sign out books, with aid of an on-line library management system purchased by the former department Chair. The program maintains subscriptions for a robust and comprehensive on-line educational tool (StatDx), as well as a new curriculum web-based resource (Rad Primer). All residents have access to these on-line educational resources.

#### EDUCATIONAL ACTIVITIES

#### 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 different national and international radiology meetings and have utilized this program support.

Residents are required to complete one 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 successfully obtained RMA scholarships and PSI awards. Leadership and engagement of the Resident Research Coordinator with the resident body has been a challenge for the program. A new coordinator was recently appointed. Goals and objectives for this position will involve overhauling the resident journal club, reviewing formal research and critical appraisal curriculum, as well as reviewing methods for supporting and enhancing resident research.

#### 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. 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 for medical students. Several PGY 1 residents participate in clinical skills instruction.

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. One of our current residents, Dr. Sasha Bhan, has recently been selected as the sole Resident Board Member at the Canadian Association of Radiologists, an important national radiology organization. Residents have opportunities to serve as an elected representative on our training committee, as well as other committees, for instance our resident website committee.

## EXTERNAL REVIEW

In 2009 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 Education programs at McMaster University. The review team affirmed that all weaknesses addressed at the time of the previous survey in 2003 were addressed satisfactorily. The reviewer outlined the following strengths and weaknesses:

### STRENGTHS

- Dedicated, dynamic, outstanding and well-respected program director who is teaching-oriented and having sufficient protected time and support.
- Department Chair who is very supportive of the program, with a strong interest in research and medical informatics.
- Strong academic program with dedicated teaching faculty.
- Cohesive and collaborative group of residents.
- A well-documented and implemented goals and objectives and CanMEDs Competencies.
- A well-structured and well-received formal mentorship program for residents.

### WEAKNESSES

- NONE identified.

The program received FULL APPROVAL. Of note, this program historically has always been successful in obtaining full approval with all external Royal College reviews.

## CHANGES TO THE PROGRAM OVER THE LAST 5 YEARS

A number of new program initiatives have developed over the last few years. These include the following:

### CAREER NIGHT

A Career Evening was developed 4 years ago. This evening is designed to provide an open forum whereby residents can educate themselves on "life after residency". Radiologists from the community and academic practices are invited to attend, as part of a panel discussion, several of whom are program alumni. An agenda and question outline is designed with extensive input from the resident body. There is opportunity for informal interaction as well as a formal question and answer session. Topics addressed include job searching, fellowship advice, differences in practices, what to look for in a job, putting together your application and CV, how to balance professional life and family life, workload, call responsibilities, etc. This event has met with great success, as determined by formal resident survey and feedback.

### COMMUNITY ROTATIONS

A mandatory community elective rotation has been formalized in the program. Each resident is required to complete a community rotation in either their PGY 4 or PGY 5 year. The requirement for this rotation specifies that this month must be experienced outside of a traditional university-based teaching hospital environment. Prior to the inclusion of this rotation, it was rare for a resident to seek a rotation outside of an academic setting. With recent program graduates and faculty recruited to community hospitals in the surrounding region, we have formed strong linkages with those facilities. This elective is now recognized as an excellent rotation experience. Most residents select hospitals within our region, including Cambridge Memorial Hospital, Guelph General Hospital and the Niagara Health System. Recently some residents have also accessed independent health care facility community clinics for this experience. While core rotations are still organized at the 4 Hamilton teaching hospitals, future rotations might include the opportunity to participate in core rotations at these community hospitals.

Several residents have also sought out international experiences. This includes one resident traveling to Africa, as

well as one who completed an international ultrasound elective in France.

#### CANMEDS CURRICULUM

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The program director spear-headed a half-day series aimed at presenting CanMEDS topics specific for radiology. These occur 4-6 times annually and are scheduled as part of the Academic Half-day. The material is presented in a case-based format. Resident groups are assigned with responding to the circulated questions and presenting to their peers. These sessions generate excellent discussion around CanMEDS topics and represent a unique format for delivering this content in a specialty-based format. This approach to teaching CanMEDS content for radiology has been shared with other programs in a book chapter:

**Finlay K.** Probyn L. Applying CanMEDS to Academic Afternoons. In: Van Deven, T., Hibbert, K, & Chhem, R. (Eds.) The Practice of Radiology Education: Challenges and Trends. Heidelberg, Germany: Springer, 2009.

In addition, this was presented to residents and faculty at a conference:

**Finlay K.** University of Western Ontario, Scholarship in Radiology Education Conference – Applying CanMEDS on Academic Afternoons. June 17, 2010, London, ON.

#### MENTORSHIP PROGRAM

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Our program has developed a mentorship program aimed at assisting with specific academic learning needs. In our model, identified potential weaknesses of a resident are addressed formally through the mentorship program, in order to foster and improve performance before the advent of an unsatisfactory evaluation or need for specific remediation. In other words, the power of mentorship is used to enhance positive professional behavior, learning skills and overall academic performance. This differs from a formal mandatory remediation plan or informal advice and guidance offered through more traditional program design or mentorships. The key step to establishing this approach to mentorship involves specific planning and discussion between the Program Director, the resident and the faculty mentor, during which the resident's strengths and weaknesses are reviewed. There is agreement on the specific area/s that require liaison

with a mentor and an educational contract is formulated to address this. Example needs assessment addressed through our mentorship program might include enhancing verbal presentation skills, establishing and maintaining effective study habits, or building self confidence. In the current model developed in our program, the need for specific mentor intervention may be initiated by the resident, or at the recommendation of the Program Director.

Our mentorship program has met with positive outcomes, when measured by success on first attempt at national certification examinations. Academic inquiry into the success of this program has been supported by a successful research grant application to the Centre for Leadership in Learning at McMaster University:

The program has been shared at two meetings:

**Finlay K.** Fenton N, Karkhanecki S. Reshaping/redefining mentorship in residency: A scholarly inquiry of learning experiences and perceptions of a unique program. Poster presentation accepted to ICRE, 2011.

**Finlay K.** Expanding Horizons in Mentorship. Research on Teaching and Learning: Integrating Practices, McMaster University, Dec. 9, 2010.

#### EVALUATION

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During the current program director's tenure, the program has switched to using a web-based evaluation system. This electronic system is supported by the Post Graduate Medical Education Office. It allows for evaluations to be more accessible and assists in determining the completion rate of evaluations, an improved method as compared with the traditional "paper system". It also provides an easier mechanism for tracking and collating evaluations. 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-month rotations, where residents work with a number of different faculty teachers (due to the nature of department schedules).

The web-based platform has enabled the program to obtain more comprehensive information on rotation evaluations. Each resident must complete a rotation evaluation at the end of their experience. The information obtained is

#### EDUCATIONAL ACTIVITIES



anonymous and collated annually. The Residency Program Committee and site coordinators review this material, as part of the overall annual program review.

Faculty evaluations are obtained in a similar fashion – all residents must complete a faculty evaluation on the two staff members they have spent the most time with during their rotation. The web-eval system has allowed the program to collect evaluations on faculty teaching. These are compiled at the end of the academic year and shared with the department Chair. Additional teaching evaluations are obtained for any faculty member who formally presents at the academic half-day. This represents a change in method for obtaining faculty evaluations, as prior to the current program director this was obtained with much less rigour at an annual informal verbal feedback session with the residents.

#### RESIDENT CALL RESPONSIBILITIES

Over the last academic year, the program committee revised the method and design by which residents provide after-hours imaging coverage. Prior to this change, two residents were assigned to cover call. One resident was assigned to the Hamilton General, who remotely also covered the Juravinski site. The second resident was assigned to the McMaster Medical Centre and covered the St. Joseph's site remotely.

It was becoming increasingly apparent to the program committee that the work responsibilities were inconsistent in terms of workload, as often one resident was much busier than the other on-call. Their physical separation made it more challenging to discuss and advise on cases, as well as share the workload. In response to this, the committee agreed to change our model to a "call centre" design, whereby both residents are housed together at the Hamilton General site after-hours. While still paired in covering the 4 hospital sites, this model allowed for more team work structure and easier consultation between junior and senior residents. The residents have actively embraced the change and all comment that this has greatly improved their on-call experience. It has facilitated the pairing of more junior residents with senior residents – a change likely to also benefit referring clinical services and patients.

With recent changes to the delivery of health care in the city, precipitated by the Access to Best Care (ABC) model, the after-hours on-call coverage was further refined. Prior to April 2010, the weekend day coverage by residents was extended to the Hamilton General site and the McMaster site, with the other 2 (Juravinski and St. Joseph's) covered by staff and or fellows only, until 4 pm. With the move of adult oncology, surgical and hepatobiliary services to the Juravinski site, the program committee reconsidered the weekend responsibilities of the residents. This shift of clinical services along with ongoing feedback from the Chair of the Radiology Examination Board highlighting resident weaknesses in plain films prompted the design of our change. Residents no longer provide day-time weekend support to the McMaster site (this is now covered exclusively by staff and fellows). One resident is now assigned to exclusive plain film reading at the Juravinski site, up until 4 pm. This meets both clinical needs and the important educational objective of enhancing resident plain film exposure. Again this has met with a very positive review from the residents, highlighting great case exposure and excellent on-call teaching. The resident covering the Hamilton General remains there during weekend days, as per historical program design.

#### CHALLENGES

##### ADAPTING TO CHANGES WITH ABC

With the shift of clinical services in Hamilton, it remains to be seen the overall impact on resident education in radiology. Fortunately our program has always been "rotation based" rather than "hospital based". Meaning, we will shift rotations to the appropriate clinical site if necessary. We have done so with several rotations for the 2011/2012 year, including the move of one month of Chest Imaging and one month of Interventional from the MUMC site to the Juravinski. We are constantly challenged with trying to site our rotations at the best facility for both case material and faculty fellowship trained expertise. The shift may also require the additional or move of some physical resources, including PACS work stations.

##### 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.

#### RESTRICTED WORK HOURS

Over the past few years, there has been increasing emphasis on restricting the post-call responsibilities of residents. This has been strongly advocated by the resident unions. Ten years ago, residents were dismissed after call by noon. This evolved to no later than 10 am. Our residents are now dismissed by 8 am, when their call responsibilities are over. With recently passed legislation in Quebec, training programs are envisioning the restricted work week for residents looming in the horizon. With no addition of time to training, the lost work experiences and case exposure are a very real issue.

#### PROGRAM EXPANSION

With Ontario Ministry initiatives to increase specialty training positions, our program is challenged to absorb a new training position for the 2011 CaRMS match. Our tightly designed rotation schedule will be challenged with this, although advantages in Hamilton include the 4 hospital resources available. The delicate balance between residents and fellows will also be challenged, if current PACS resources are not gradually expanded alongside.

#### ENHANCING EDUCATION IN RESEARCH SKILLS/ CRITICAL APPRAISAL AND JOURNAL CLUB

Although currently identified by the program committee and program director as a minor weakness, it is hoped that the newly assigned resident research coordinator will assist in addressing this issue.

#### SUPPORTING SUBSPECIALTY EDUCATION

There is a need to pair residents and rotations with faculty subspecialty expertise. While ample subspecialty expertise exists at all sites for some specialties (for instance body imaging), this is not the case for all. Some subspecialty expertise and case volume is lacking for robust dedicated rotations, for instance in cardiac imaging.

#### EDUCATIONAL ACTIVITIES

#### ACADEMIC TIME FOR PD

The current program director has been supported for administrative time exclusively by one professional practice. While there are other administrative roles held by faculty members around the city, the demands on the program director and need to uphold specific training requirements impart a particular need for administrative time and financial support for this position. Given the advantages of resident services to all groups, the 11 year commitment by the Henderson group is commendable, but has also been financially punitive.

#### FELLOWSHIP



Dr M. Patlas

#### 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 avail-

able 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.

## ADMINISTRATION/ORGANIZATION AND STRUCTURE

Over the last three years, the program has moved from being exclusively hospital-based to a centrally administered organizational structure, through the office of the Department of Radiology at the University, allowing for standardization of the fellowship experience. The subspecialty structure of the department is increasingly reflected within the Fellowship Program, such that more fellowships are focusing on system-based education.

### 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 heads the Fellowship Program Committee, which consists of the Chair Dr.Koff, Departmental Education Coordinator Dr.Harish and city-wide Fellowship Program Coordinators.

There are 12 funded fellowship positions offered by four major hospital departments. All fellowships are at least one year in duration. Interventional and Musculoskeletal Imaging fellows rotate through more than one department; all others spend the duration of the fellowship at a single site. Research is now an integral component of the program – protected research time (one day a week) is available to all Radiology fellows, and fellows are strongly encouraged to present their research at scientific meetings. All fellows are expected to submit at least one peer-reviewed paper on their research project and present their projects at the annual McMaster Radiology

Fellowship Research Day, in order to complete their requirements for the fellowship.

### FELLOWSHIP APPLICATION, SELECTION & EVALUATION PROCESS

Application forms are available for downloading from the Department of Radiology website, which also provides the necessary information and steps for the application process. Applicants are short-listed for interviews, based on their academic merit and letters of referral. The interview process consists of the applicant meeting the fellowship coordinator and additionally three to four members of the specific subspecialty or modality. Based on input and assessment from all, fellows are scored and rank ordered. The Fellowship Program Committee works in close consultation and coordination with the office of Postgraduate Education of the McMaster University. Fellows who join the Department are evaluated by their supervisors every three months. Every fellow has access to their individual evaluations and is able to discuss their progress with their supervisors, at the time of these evaluations.

### NEW FELLOWSHIP POSITIONS

Creation of new fellowship positions are adhered to departmental guidelines. New positions are not created unless there is documented proof that goals and objectives can be met and the additional fellowship will not impact negatively on the training of Residents. The Residency Education Committee has a strong input with respect to acceptance or rejection of proposed new positions, to ensure that the Fellowship Program does not grow at the expense of the Residency Program.

Proposals for new positions are reviewed, first by the Fellowship Program Committee followed by final approval by the Chairman. A detailed written proposal is needed, which includes:

- Specific goals, objectives and duties for the new position and a discussion of how these differ from resident goals, objectives and duties;
- A letter of support including funding for the position from the Site Chief;
- A discussion of how service responsibilities will be configured so as to minimize competition

between residents and fellows;

- A discussion of the expected impact (negative and positive) of the added position on existing resident rotations, including details of how PACS stations and how the number of case studies will be shared;

All new fellowship positions, if approved, are only allowed on a conditional basis for a period of one year, with subsequent review of its impact on resident training. For instance, a position may be created in anticipation of increased volume of work, which may not materialize. In these instances, the fellowships are either terminated, or put on "probation" for an additional year.

Twelve (12) fellows had been enrolled in the Program in 200-2011 academic year. In September of 2010 a Fellows Welcome Dinner was arranged to greet new Fellows and to provide a networking opportunity.

#### DEPARTMENTAL RESEARCH DAY

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Historically fellows did not participate at the Research Day of the Department of Radiology. In 2009, participation became a requirement for the completion of fellowship. Terms of Reference for the Research Day were established in collaboration with the Chair of the Department and the Residency Program Director.

The first combined Research Day took place on March 24, 2010. Participation of fellows helped to transform this half day event into a full day academic activity.

#### CONTRIBUTION TO POSTGRADUATE EDUCATION

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An expectation of the Fellowship Program is contribution to the Postgraduate education program. In 2010-2011, Fellows participated in teaching Radiology at other Programs residents. Neurosurgery residents had being taught by Neuroradiology fellow Dr.Shuster.

The fellows are also asked to present at each of the City Wide Rounds which are focused on their subspecialty area and give at least one set of teaching rounds at their site every two weeks.

#### CREATION OF AWARD FOR THE BEST FELLOW

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Terms of reference for the Award have been prepared in collaboration with Dr.Koff and Dr.Harish. We are planning to grant first award in 2011-2012 academic year.

## EDUCATIONAL ACTIVITIES

## OBJECTIVES

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Web-based assessment of fellows every three months and feedback from fellows regarding the performance of the program

Establishment of city wide fellowships, including the rotation of fellows to ensure that each fellow benefits from the most complete exposure in his/her subspecialty, and is advancing and gaining in experience. Existing citywide Musculoskeletal and Interventional radiology fellowships model will be used.

#### INCREASE AMOUNT OF PUBLICATIONS AND ABSTRACTS AUTHORED BY FELLOWS

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Appointment of a part time (0.5 FTE) program assistant to support Program Director and free more time he can dedicate to duties related to program development. More specifically, this resource will screen paper and electronic requests and filter incomplete applications (type of fellowship, candidate's resume, letters of reference, etc...).

## Graduate Education

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The Department is in the process of creating a Master Program in Medical Imaging Informatics to answer the needs of a fast growing field of activity where there is a lack of skilled professionals.

The program has been drafted and preliminary talks have taken place with eHealth at McMaster, and we are looking at on-site competencies and at existing courses which can be integrated in the program.

The faculty who will participate in the teaching of these courses have been identified and the program will start in September 2012 as a new track within eHealth.

The curriculum will be 2 years in length with a research project leading to a thesis.

Students have already expressed an interest to enrol in the program.

## Continuing Education Activities

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### VISITING PROFESSOR PROGRAM

The program is coordinated by Dr. Sat Somers, in collaboration with the University of Toronto. The program incorporates a minimum of eight visiting Professors a year. An attempt is made to cover all areas of radiology, each year. The speakers are chosen based on their knowledge of the subject and excellence in teaching. Each visiting Professor gives three lectures and shows board-type cases to the residents. These teaching sessions are open to everyone and are videoconferenced through OTN.

The titles for presentation are selected by consensus from a list provided by the speaker. Radiologists, with an interest in the area, and residents provide an input into the selection of the topics. To encourage networking, two residents and a few faculty members invite the visiting Professor to dinner, which is a unique opportunity for the residents to have better interaction with the visiting professor and ask questions in his field of interest.

### CITY WIDE ROUNDS

Once a month, these rounds are designed to present interesting cases in one of our subspecialties. They rotate between all our sites under the leadership of a local radiologist in the subspecialty.

## Additional Teaching Initiatives

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### CORA



#### Dr J. Dobranowski

Created and lead by Dr Dobranowski, at St Joseph's Healthcare, the CENTRE FOR RADIOLOGICAL ANATOMY (CORA) is a state-of-the-art site development dedicated to the presentation and learning of human anatomy through sophisticated, radiologically based 3-D visualization techniques.

CORA's goal is to change the approach of human anatomy learning by:

1. Creating a physical educational structure devoted to radiological anatomy utilizing 21st-century imaging and visualization technology. The centre includes:
  - a. A fully digital 3-D lab where learners can conceptualize anatomy using the latest in 3-D software technology;
  - b. an analogue 3-D lab using stereolithography to produce 3-D plastic models for tactile learning, and
  - c. a virtual reality area where anatomy will be experienced from a completely virtual perspective.

2. Providing a unique research environment to gauge the effectiveness of the digital environment on learning and retention abilities for medical students from a variety of specialties.
3. Developing radiological anatomy curriculum designed to provide health-care providers of the future with the knowledge necessary in the advancing world of diagnostic imaging and its impact on patient management.

### Summary of Progress

Although the progress has been slower than initially intended, CORA is moving forward with module development and expansion of the curriculum to include neuroimaging, abdomen, MSK and Urology.

### Chest X-ray Interpretation Course

Over the course of the last 2 years, CORA has established a comprehensive Chest X-Ray interpretation Course that is currently being offered as part of an undergraduate radiology elective. The course has been developed to address the AMSER (Alliance of Medical Student Educators in Radiology) and MCC (Medical Council of Canada) topics. 82 unique modules have been created and form part of the Chest curriculum. The modules are categorized as knowledge based, task based or practice-case based, with several of the modules having been created with direct involvement of the undergraduate students. Upon completion of the course, the students will have fulfilled the curriculum requirements outlined by AMSER. These modules – currently used within the CORA Radiology Skills Lab – are in the process of being adapted/converted to self-directed e-learning modules that medical students across all three McMaster University campuses will be able to access through the medportal e-curriculum portal at any time, any place, self-paced, self-directed radiology and radiological anatomy learning

## GLOBAL HEALTH

The Department joined the Global Health Office in the office's mission of globalization in medical education and implications for delivery of education and healthcare. The highlights for 2010-2011 include the following activities

### CAREG Program

In June 2010, the Department of Radiology (Dr Eli Tshibwabwa and Dr David Koff) with the Faculty of Health Sciences Global Health Office, submitted two proposals to the Association of Universities and Colleges of Canada (AUCC) for the Canada-Africa Research Exchange Grants (CAREG) program in partnership with both the Department of Radiology at Makerere University College of Health Sciences and Ernest Cook Ultrasound Research Institute (ECUREI), both in Kampala (Uganda). CAREG is a two-year pilot program, funded by the International Development Research Centre (IDRC), which aims to support short-term exchanges between Canadian and African universities and research institutes that address one or more of IDRC's research themes through:

the development of new applied research and training collaborations or the strengthening and broadening of existing ones; and

the improvement of the know-how and knowledge of African and Canadian academics

In September 2010, The CAREG Selection Committee reviewed fifty-four eligible proposals, but our projects did not meet the eligibility criteria that the two African institutions (ECUREI and Makerere University) should have been eligible members of the AUCC.

### CAREG Program (Continued)

In August 2010, the Department of Radiology (Dr Eli Tshibwabwa and Dr David Koff) with the Faculty of Health Sciences Global Health Office submitted again three proposals to the Association of Universities and Colleges of Canada (AUCC) for the Canada-Africa Research Exchange Grants (CAREG) program in partnership with both the



Department of Radiology at Makerere University College of Health Sciences, Adekunle Ajasin University ( Nigeria) and International University of Management ( Namibia).

In the spring of 2012, IDRC will determine whether or not the CAREG program should be renewed.

### Muskoka Initiative Partnership Program

In January 2011, in collaboration with the Faculty of Health Sciences Global Health Office, the Department ( Dr Eli Tshibwabwa and Dr David Koff) submitted a proposals to the Canadian International Development Agency Muskoka Initiative Partnership Program (MIPP) in partnership with Sonosite Canada Inc, Muhimbili University Health and Applied Sciences ( MUHAS) school of Radiography in Dar- es -Salaam ( Tanzania), the Department of Radiology at Addis Ababa University and Hawassa College of Health Sciences both in Ethiopia. MIPP is a three-year pilot program, funded by the CIDA, and the McMaster University proposal was entitled “East Africa: Reducing risks in Maternal Health” to support the use of compact ultrasound in rural resources stricken settings to boost the diagnostic capacities of Health workers and the referral of high risk patients diagnosed using compact ultrasound technology and telemedicine..

In July 2011 the CIDA review found our proposal did not demonstrate a convincing response to needs in rural communities, or to women in particular, and that beneficiaries were more likely to be local universities rather than the local population.

The review also found the analysis of gender to be insufficient and did not address a change of behaviour towards women’s roles in society. Crosscutting Themes (Equality between women and men). Finally, there was no indication how local partners and communities could either repair or replace equipment after the five-year warranty had run out.

August 2011, The Global Health Office accepted the reviewer’s comments, and agreed to take into account the CIDA Reviewers’ comments and try again the next round of calls. We are very interested in pursuing this idea as these types of capacity building programs are important.

### Global Health Speaker’s Series, Global Health Office

On January 31, 2011, Dr David Koff was the speaker for the Global Health Speaker’s Series, Global health Offices, and the title of his conference was” Globalization of Radiology”.

### The Master of Science in Global Health Program.

In April 2011, Dr Eli Tshibwabwa was a Reader, Admissions, Candidates’ submission, for the upcoming Class (Fall 2011).

### Saving Lives At Birth: A Grand Challenge For Development. RFA-OAA-11-000006: USAID, Grand Challenges Canada, Bill and Melinda Foundation.

In May 2011, in collaboration with the Faculty of Health Sciences Global Health Office, the Department ( Dr Eli Tshibwabwa and Dr David Koff) submitted a proposal to USAID and Grand Challenges Canada , in partnership with Sonosite Canada Inc. and Muhimbili University Health and Applied Sciences ( MUHAS) School of Radiography in Dar- es -Salaam ( Tanzania). Our proposal was entitled “Tanzania: Reducing risks in Maternal and Neonatal Health at Birth” to support the use of compact ultrasound in rural resources stricken settings to boost the diagnostic capacities of health workers and the referral of high risk patients diagnosed using compact ultrasound technology and telemedicine.

In July 2011 our proposal was not selected to advance to the final step of review. However, the USAID Review comments were as follows “Given the highly competitive nature of this program, you should be congratulated on having advanced to the third stage in the review process”.

### Educational Report

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



# Research Activity



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# Research Activity

## Introduction: Research in Radiology

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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.

### 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, MIIRCAM, and Nuclear Medicine and we have included below a brief outline of each.



## IRC: IMAGING RESEARCH CENTRE



Dr. Michael Noseworthy

Under the direction of Dr. Noseworthy, the IRC goal is the assessment of normal and diseased tissue microstructure and the resultant modulation of tissue metabolism that ensues. The research is done through development of novel magnetic resonance imaging (MRI) and *in vivo* nuclear magnetic resonance (NMR) spectroscopy methodologies. In addition to MR approaches, recent developments have included focus on multi-modal imaging. This is currently done using a PET/CT system in the IRC. However, in Dr. Noseworthy's lab PET/CT and all datum types from MRI are being merged and co-registered on a common platform to be tracked in real time using infra-red/RF and ultrasound. The resultant work provides more comprehensive and diagnostically useful tissue evaluation protocols including both anatomic as well as functional information.

### SPECIFIC PROJECTS

The research in Dr. Noseworthy's lab are divided between a number of foci:

1. brain;
2. abdominal organs (liver kidney);
3. muscle;
4. cancer

All foci involve similar imaging strategies/themes. One of the goals is to derive as much information as possible

without the use of MRI contrast agents which, although the safest injected agent in diagnostic imaging, has been linked to Nephrogenic Systemic Fibrosis (NSF) in some people. A general methodological theme is to measure structure and function in a tissue of interest and repeat the imaging after a normal/natural physiological perturbation. The resultant change in structure, biochemistry and/or function (oxy:deoxyhaemoglobin ratio) are then reflected in a change in contrast. This approach is routine in functional brain MRI (fMRI). But in Dr. Noseworthy's lab this approach has been successful in showing healthy liver, muscle and kidney function. For liver the contrast was induced by a standardized meal while for kidneys diuresis induced contrast. Muscle functional imaging is easily done while exercising inside the MRI. Dr. Noseworthy's team has built a number of iterations of MRI compatible ergometers. Recently with funding from the Canadian Foundation for Innovation (CFI) Dr. Noseworthy has purchased digitally controlled MRI compatible ergometers, ultrasound, and optical imaging equipment to develop a centre for advanced muscle imaging. This is a continuation of the work done in Dr. Noseworthy's lab showing how diffusion tensor imaging (DTI) and fiber tractography can be used to 3D visualize muscle injuries with unprecedented sensitivity and visual representation. The future of imaging within Dr. Noseworthy's lab will see a combined MRI/optical imaging system not only for legs/arms, but also other parts of the body.

In addition to imaging technology development, Dr. Noseworthy's group is actively developing hardware and software for *in vivo* metabolic evaluation. He has published a number of *in vivo* brain <sup>1</sup>H-MRS papers. However, the 3T research MRI at the Imaging Research Centre (IRC) at St. Joseph's Healthcare is equipped with a broadband transceiver and second RF transmit channel for non-hydrogen associated imaging and NMR spectroscopy. Dr. Noseworthy's group has developed faster methods for <sup>31</sup>P measurement, which includes the body's high energy phosphates (i.e. ATP, ADP, PCr, Pi, and phosphate mono and diesters). The work involves both software (MRI pulse sequence) and hardware (specialized RF imaging coils) development. The work is all done locally at the IRC by Dr. Noseworthy's graduate students, technicians, and postdocs, where he has his own RF electronics shop, biochemical laboratory and advanced computer network. The <sup>31</sup>P work is being applied in liver, and muscle pre-

dominantly. However, some designs have been built for the Sentinelle breast imaging system. In addition to <sup>31</sup>P work, Dr. Noseworthy is exploring the quadrupolar nature of sodium (<sup>23</sup>Na) in specialized imaging called double and triple quantum filtering. This approach is hoped to be of use in better identifying soft tissue injuries.

One of the more mathematical developments coming from Dr. Noseworthy's research is in the area of non-linear dynamics (NLD) and chaos theory. Using fast blood oxygen level dependent (BOLD) imaging combined with NLD Dr. Noseworthy's group has shown a novel form of contrast for cancer imaging that may prove to be useful in understanding tumour aggressiveness. Following an award from the European Federation of Medical Physics (EFOMP), the work was published in the journal 'Physica Medica' and was one of the top 25 downloaded papers from that year. Dr. Noseworthy's group is undergoing trials with this method in prostate, breast, and colorectal cancer to compare against histological sections through tumours. In addition to use in cancer the methodological approach has found application in assessing liver function, and in differentiating early onset Alzheimer's disease from healthy aged matched controls.

## LAB GROUP

Dr. Noseworthy is a Director of the McMaster School of Biomedical Engineering and a tenured Associate Professor in Electrical and Computer Engineering. Additionally he is an associate member of Radiology, Computational Engineering Science, and Medical Physics. Also, he is an adjunct professor in Clinical Studies at the Ontario Veterinary College at the University of Guelph and Adjunct Professor in Medical Imaging at the University of Toronto. In addition to his academic rolls he is also the Director of the Imaging Research Centre, at St. Joseph's Healthcare and credentialed as special clinical staff (Medical Physics) in Diagnostic Imaging at St. Joseph's Healthcare. His graduate students are enrolled in predominantly electrical and biomedical engineering programs and also a few in medical physics.



## NUCLEAR MEDICINE



Dr. Karen Gulenchyn

Between 2009 and 2011, Nuclear Medicine transferred the responsibility for the operation of the Cyclotron and Radiochemistry to the newly established Centre for Probe Development and Commercialization (CPDC) led by Dr. John Valliant. The CPDC and Nuclear Medicine have continued and broadened their research collaboration since the transfer occurred. The development of new radiopharmaceuticals is at the centre of Nuclear Medicine research endeavours and without this vibrant partnership, much of what has been accomplished would not be possible. We have been equally fortunate to associate with the Ontario Clinical Oncology Group housed at the Juravinski Hospital and Cancer Centre and have benefited from the mentorship of its co-director, Dr. Mark Levine.

Research in Nuclear Medicine is conducted in five broad areas; namely, 1) radiopharmaceutical development, 2) personalized cancer care by in-vivo characterization of tumors & treatment response, 3) advanced cardiac diagnostic imaging, 4) body composition assessment with a focus on bone mineralization and structure, 5) development of imaging detectors and methodologies.

### RADIOPHARMACEUTICAL DEVELOPMENT

#### IMAGING PHYSICS PROGRAM

Troy Farncombe currently supervises 6 full-time graduate students (3 PhD, 3 MSc) within the Departments of Medical Physics and in the School for Computational



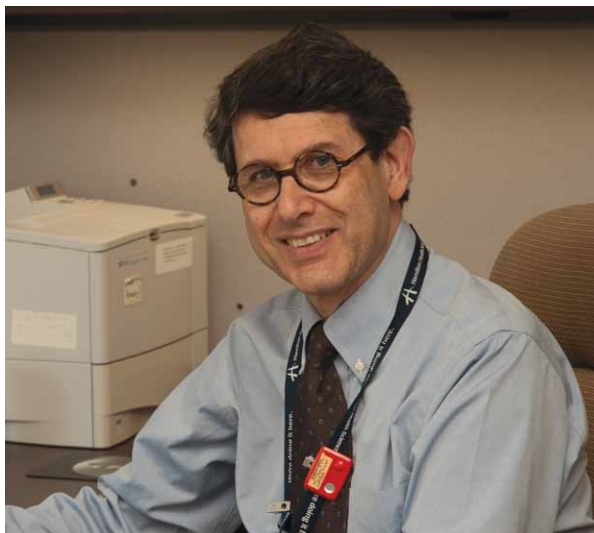
Engineering. He is presently funded by the Ontario Research Fund (ORF) and the Ontario Institute for Cancer Research (OICR) and is involved in both hardware and software development for use in radionuclide imaging.

Work funded by the ORF involves the development of next-generation radiation detectors for radionuclide imaging, specifically, the use of solid-state detectors (e.g., Cadmium Zinc Telluride, CZT, and Silicon Photomultipliers, SiPM's) for use in SPECT. The ultimate goal of this project is to develop replacement technology for existing SPECT and SPECT/CT devices that produces superior image quality, is more patient friendly and more cost-effective than existing imaging technology. Also investigated are specific imaging methods for improving image quality and reducing patient dose using CZT detectors. This work is supported in part by General Electric Healthcare, Redlen Technologies and SensL, Inc.

In parallel, new image reconstruction algorithms and methods for multi-nuclide SPECT imaging are being developed. These methods involve the use of novel dynamic SPECT and accelerated Monte Carlo-based modeling to track photon transport and compensate for various image degradation effects such as photon scatter. These techniques have been successfully used to obtain accurate quantitative SPECT images and are being extended to obtain patient specific dosimetric information for each scan.



## MIIRCAM: MEDICAL IMAGING INFORMATICS RESEARCH CENTRE AT McMASTER UNIVERSITY



Dr D. Koff

The **Medical Imaging Informatics Research Centre at McMaster** was created in November 2009 as a new structure where radiologists, fellows and residents interested in informatics research would have access to some fundamental resources, to bring together clinicians and engineers in order to bridge the gap between clinical studies and computer sciences in order to solve specific issues in Medical Imaging and serve as common cement to all involved in research.

It came to life thanks to the conjunction of three factors:

1. the support from the Dean of the Faculty of Health Sciences, Dr Kelton, who committed \$50,000 a year for 2 years as start up money;
2. the support of the Vice-President Research at McMaster University, Professor Elbestawi, who agreed to pay the rent of a 1,200 square feet office space at the McMaster Innovation Park on Longwood for 5 years;
3. A commitment of \$25,000 a year for 2 years from the Vice-President Research at the Faculty of Health Sciences, Dr Collins, to recruit a part-time support staff.

MIIRCAM's office has been equipped with workspace for students and researchers, adequate number of computers, high-resolution monitors and a meeting space.

**GOALS AND OBJECTIVES WERE  
DRAFTED AS FOLLOWS:**

1. MIIRCAM is the research arm of the Department of Radiology, and provides support to faculty, residents and fellows:
  - a. Help in identifying and building research projects
  - b. Writing research proposals
  - c. Structure budgets and help identifying sources of funding
  - d. Drive the Principal Investigator through REB and identify the appropriate path
  - e. Interact and facilitate relations with McMaster Industry Liaison Office
  - f. Facilitate access to statistical support
  - g. Track departmental research projects and monitor the use of funds
  - h. Offer technical infrastructure to radiologists, engineers, students and any researcher at McMaster University
2. Identify specific projects related to the use of information technology in medical imaging:
  - a. Build a team of experts from various fields and backgrounds
  - b. Identify industry and government partners
  - c. Write and submit grants
3. Build an education program to train medical imaging informatics professionals in partnership with Mohawk College, Engineering at McMaster University.

**A TEAM WAS ASSEMBLED;**

**DAVID KOFF, MD IS THE DIRECTOR OF THE CENTRE**

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Dr. Koff has been involved for many years in Medical Imaging Informatics through numerous research projects and education programs, especially medical image transmission over the Internet and image compression on which he worked extensively for more than 10 years. He has been an advisor to Canada Health Infoway and is a co-founder and co-chair of IHE Canada.

**ANDRE MATOS, PHD IS THE MANAGER**

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Andre graduated in 1998 in Data Processing Technology, Dr Matos has a Master's Degree and Ph.D. in Medical Science (Medical Imaging Processing artificial neural network integrated with a PACS and IT solutions for Medical Environment) and software certification by Sun Microsystems.

**PETER BAK, PHD IS AN ASSISTANT PROFESSOR**

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Peter is an Engineer with over 18 years of experience in the Diagnostic Imaging market with specific emphasis on the interoperability of Picture Archiving and Communications Systems (PACS) and Radiology Information Systems (RIS) within the context of an Electronic Health Record (EHR).

He is recognized globally as a leader in Diagnostic Imaging interoperability architecture and integration with Electronic Health Record systems.

## Achievements

### INDUSTRY PARTNERSHIPS

**AGFA HEALTHCARE**

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Agfa HealthCare, a member of the Agfa-Gevaert Group, is a leading provider of IT-enabled clinical workflow and diagnostic image management solutions, and state-of-the-art systems for capturing and processing images in hospitals and healthcare facilities.

Agfa HealthCare has sales offices and representatives in over 100 markets worldwide. Sales for Agfa HealthCare in 2009 were 1,178 million Euros.

Agfa HealthCare has signed an agreement with the Government of Ontario, Canada for a \$29.6 million governmental grant to support the growth of the company's Research, Development and Regional operation centers in Toronto and Waterloo (Canada). The grant will support a total of nearly \$200 million investment by Agfa HealthCare in its Ontario operations, creating 100 new positions and re-investing in 276 existing jobs.

Agfa agreed to collaborate with MIIRCAM as interface to access the clinical expertise of the radiologists at



McMaster University, including the satellite campuses, and to share resources for specific research projects, as well as being the industry partner on grant applications.

Agfa has provided MIIRCAM with a fully operational PACS for a book value of more than \$200,000.00 and provides engineering resources and supports Co-op students.

#### GE HEALTHCARE

GE has agreed to fund MIIRCAM at \$50,000.00 a year for 3 years to support research activities.

GE has also invested \$30,000.00 in a project on image compression with University of Waterloo.

#### MOHAWK SHARED SERVICES (MSS)

MIIRCAM and MSS have agreed to develop projects based on the following criteria:

- improve access to care and decrease wait times for the patients in WW & HNHB LHINS
- add value or decrease costs for the organizations participating in the Mohawk DI-r
- have support or sponsorship from one or more organizations in WW & HNHB LHINS, the LHINS CEOs and/or the Regional eHealth Leads.
- have the ability to grow to include all the participating organizations in WW & HNHB LHINS after the initial pilot project is completed.

## Research Projects

### IMAGE COMPRESSION

Based on prior work performed by 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, more research was commissioned:

#### 1. **Evaluation of Irreversible Compression Ratios for Thin Slice CT Images**

Principal Investigator: David Koff

Our 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. More evaluation was required to refine this finding. This was performed from December 2008 to January 2010, funded by Canada Health Infoway for \$183,750.00; the Compression Standards were revised accordingly in April 2010.

#### 2. **Adoption of Irreversible Compression Phase 1** Principal Investigator: David Koff

After demonstrating that Lossy Compression is acceptable, we need now to implement it in production. The scope of this study is to assess the capacity of the PACS to support compression, test physician engagement and draft standards of practice. Timeframe is October 2010 to March 2011. Funded by Canada Health Infoway in partnership with Mohawk Shared Services for \$94,000.00.

#### 3. **Objective Quality Assessment and its Use in Optimizing Diagnostically Lossless Compression of Medical Images**

Principal Investigator: Zhou Wang PhD, University of Waterloo

This project aims to;

- design novel automatic image quality measures for medical images that can accurately predict subjective quality evaluations by radiologists;
- develop advanced medical image compression algorithms that are optimized for our novel quality measures; and
- 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 will be carried out through close university-hospital-industry collaborations, and is expected to benefit Canada's healthcare,

workforce and medical imaging-based economy.

It is funded by NSERC-CRD in participation with Agfa for \$40,000 a year for 3 years. An additional \$30,000 a year expected from OCE.

## **REM: RADIATION EXPOSURE MONITORING AND EVIDENCE BASED DECISION SUPPORT.**

**PRINCIPAL INVESTIGATOR: DAVID KOFF**

The proposed project will establish a network of radiation exposure registry systems for monitoring and decision support. This radiation registry will be the first of its kind to collect and store radiation and relevant clinical data generated from participating hospitals and medical centres across Atlantic and Ontario provinces. 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 of appropriate use of radiation procedures will be measured and monitored on a real-time bases. Reporting and alert mechanisms will be implemented to give warns for any excessive application of radiation and misuse of radiation procedures. A matrix of correlating factors reflecting possible impact from exposures to radiations will be established. Outcomes and benefit, in technical and social-economical terms, will be measured. The project will make use of industry standards and open source solution whenever possible to ensure maximum interoperability of our system and tools. Results will be easily integrated into participating hospital safety monitoring system, regional health authority reporting system and future decision support applications.

From November 2009 to November 2011.

Funded by NRC and Agfa HealthCare for \$3,008,750.00

## **SECURE INTELLIGENT CONTENT DELIVERY SYSTEM FOR TIMELY DELIVERY OF LARGE DATA SETS IN A REGIONAL/NATIONAL ELECTRONIC HEALTH RECORD**

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 health-care 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.

Funding by ORF: \$1,411,000.00 for a total value cash and in-kind of \$6,292,860.00.

Additional, smaller projects are supported by MIIRCAM. One example of this is;

### EVALUATING RADIOLOGIC STUDIES OF ACUTE PATHOLOGIES ON MOBILE DEVICES

Compare mobile devices (iPhone, iPad, iPod Touch) with traditional workstation/laptop to assess diagnostic accuracy of specific acute pathologies from CT studies.

- PI: Dr. Michael Pazaratz
- Budget: \$5,500

Further small projects funded by the Radiology Research Committee are supported by MIIRCAM.

### The Future

MIIRCAM has more ambition for the future:

#### NEW SUPPORTING TOOLS FOR RESEARCH

Image database with resource data made available to researchers and scientists and accessed through original search criteria such as physical properties of the images.

Specialized viewer, which can be used for quality assessment studies requiring comparison between original images and post-processed images.

MIIRCAM wants to make its Research PACS available to the Research community at McMaster University, and a business model has been drafted with a fee for the vendor based on a projection of the number of images stored in the database, which cost should be included in the grant application. Support team will be required to maintain this resource.

#### NEW RESEARCH PROJECTS:

New developments on pre-existing research at MIIRCAM

- Image compression applied to new modalities, video applications, advanced post-processing, etc...
- Data mining on the Radiation Registry.

New research

- Decision support and appropriateness
- Benefits Evaluation
- Zero Footprint viewer
- Simulation in radiology

In order to succeed in its mission, and achieve its goal of becoming a leader in collaborative applied imaging research, MIIRCAM requires additional funding to maintain its support team and invest in the tools needed to enable its research.



## CENTRE FOR RADIOLOGY HISTORY

### Dr Z. Maizlin

The field of Medical History belongs to both Medicine and History. It is traditionally both popular and underdeveloped. It is also traditionally based on enthusiasm and personal interest. However, the scientific potential and publication perspectives of this field are not less than in any other field in Medicine or History. Discoveries in this field bring fame and publicity to the University exactly as do discoveries in any other area. Dr. Maizlin likes history and tries to introduce the relevant historical knowledge to the teaching of radiology. The feedback he received after his lectures proved that understanding the historical background of radiology facilitates the learning process.

Motivated by his love of history and in the hope that others might share this, Dr. Maizlin proposed the idea of a "Centre for Medical and Radiological History" which became functional from May 2010 with the support received from the Dean and Chair.

With the help of the staff of Dr. A. Neville, presentations about the History of Medicine and Radiology were delivered to medical students at McMaster.

In the spring of 2011, an opening evening event was organized where lectures, one on neurological injuries in the Iliad, the other on the history of the invention of the CT scanner were presented by Dr. J. Sahlas and Dr. Z. Maizlin for the medical community. .

A new event is being organized for the fall of 2011.

In the spring, a competition was held for the best project concerning medical history among McMaster medical students, residents and fellows.

Two research projects have been completed and are being prepared for publication.

Two new projects have been initiated;

1. Do we really need to thank the Beatles for the development of the CT scanner?
2. People behind the development of the CT scanner

The CAR graciously agreed to hold an author-signing and sales event by Dr. Z. Maizlin for his book "Wonders of Radiology" at the CAR 2011 annual meeting. The President of the CAR greeted the McMaster initiative in establishing the Centre for Medical and Radiological History.

## 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.

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 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 Funding

FUNDING PERIOD	NAME	ROLE	FUNDING SOURCE	AWARD	PROJECT TITLE
2005-2011	Noseworthy, Michael	Principle applicant	Natural Sciences and Engineering Research Council of Canada (NSERC), Discovery Grant	\$108,500.00	Microvascular evaluation using correlative magnetic resonance imaging, analytical electron microscopy, and non-linear dynamics.
2007-2009	Noseworthy, Michael	Co-applicant	Research Network: Canadian Centres Battling Cancer & Blood Disorders in Children	\$94,000.00	Neuro-imaging of white matter & neuro-cognitive outcome following cranial radiation for pediatric brain tumors.
2007-2010	Noseworthy, Michael	Co-applicant	Canadian Institutes for Health Research (CIHR), Neurosciences, Mental Health & Addiction	\$231,957.00	Functional imaging of inhibitory control and error detection in attention deficit hyperactivity disorder (ADHD)
2008	Chirakal, Raman	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$10,000.00	Development of an Efficient PET Tracer for the detection of Human Melanoma
2008	Webber, Colin	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$12,000.00	Knee Osteoarthritis and the Formation and Degradation of Cartilage
2008	Maizlin, Zeev	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$15,100.00	Balloon Assisted Vertebral Augmentation
2008	Grynspan, Jonathon	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$11,500.00	Feasibility Study Regarding the Utilization of Volumetric, Spin Echo, MRI Sequences in the Early Detection of MS
2008	Mourtzakis, Marina	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$7,424.00	Evaluation of the Time-Course of Changes in Body Composition of Cancer Patients
2008-2010	Koff, David	Principle Investigator	Canada Health Infoway	\$183,750.00	Evaluation Irreversible Compression Thin Slice CT
2008-2012	Farncombe, Troy	Co-investigator	Ontario Institute of Cancer Research	\$12,000,000.00	1 mm Cancer Challenge
2009	Noseworthy, Michael	Principle applicant	Canadian Foundation for Innovation (CFI) Leaders Opportunity Fund	\$259,000.00	Non-invasive imaging of healthy and diseased human skeletal muscle.
2009	Dhamanaskar, Kavita	Principle applicant	Hamilton Health Sciences Diagnostic Services Research Fund	\$10,000.00	Breast MR: Case Based Review with Radiology – Pathology Correlation
2009	Bhan, Sasha	Principle applicant	Hamilton Health Sciences Diagnostic Services Research Fund	\$7,500.00	Cost-Effectiveness of Treatment Strategies .. Ablation or Cryoblation.
2009	Chourdur, Hema	Principle applicant	Hamilton Health Sciences Diagnostic Services Research Fund	\$3,000.00	Bone Marrow Edema Patterns for Research
2009-2011	Koff, David	Principle Investigator	NRC and Agfa Healthcare	\$3,008,750.00	REM: Radiation Exposure Monitoring and Evidence Based Decision Support
2009-2010	Noseworthy, Michael	Principle applicant	Ontario Research Commercialization Program (POP)	\$22,000.00	Quantification of whiplash injury using a novel MRI RF coil and functional muscle MRI fractal dimension mapping.
2009-2010	Noseworthy, Michael	Co-applicant	Fundação para a Ciência e a Tecnologia (FCT) Ministério da Ciência, Tecnologia e Ensino Superior, Portugal	\$243,428.00	Evaluation of the mechanical load applied on the musculoskeletal system. Development of "in vivo" experimental techniques and modeling methodologies.
2009-2011	Gulenchny, Karen	Co-applicant	Canadian Institutes of Health Research (CIHR)	\$450,000.00	The formulation and clinical testing of I-123 Iodohippuran as an alternative to Tc-99m MAG3 for assessment of renal function in patients with kidney disease.
2009-2011	Gulenchny, Karen	Co-applicant	Canadian Institutes of Health Research (CIHR)	\$1,121,700.00	Rubidium PET - An alternative radiopharmaceutical for myocardial imaging (Rb-ARMI)

FUNDING PERIOD	NAME	ROLE	FUNDING SOURCE	AWARD	PROJECT TITLE
2009-2011	Noseworthy, Michael	Co-applicant	Type A Grant – Ontario Mental Health Foundation, OMHF	\$110,000.00	Glutamate & GABA paediatric OCD: A proton magnetic resonance spectroscopy study.
2010	Noseworthy, Michael	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$12,000.00	Flow and Susceptibility Weighted Imaging (SWI) Plug-in Development for the Osirix Framework
2010	Midia, Mehran	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$5,000.00	Ultrasound Guided Diagnostic Cervical Medical Branch Block
2010	Pazaratz, Michael	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$5,500.00	Evaluating Radiologic Studies of Acute Pathologies on Mobile Devices
2010	Stewart, Lori	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$15,380.00	EPOCIN – (Effective Prevention of Contrast Induced Nephropathy in CT)
2010-2011	Koff, David	Principle Investigator	Canada Health Infoway in partnership with Mohawk Shared Services	\$94,000.00	Adoption of Irreversible Compression Phase 1
2010-2011	Gulenchyn, Karen	Co- Investigator	HHS Departmental Funding	\$50,000.00	Improved diagnosis of osteoporosis by combining Vertebral Fracture Assessment (VFA) with bone mineral density measurement in a single session.
2010- 2011	Gulenchyn, Karen	Co-applicant	Juravinski Cancer Centre Foundation	\$49,200.00	Clinical Utility of a Novel Molecular Breast Imaging Gamma Camera (THORN)
2010- 2013	Gulenchyn, Karen Noseworthy, Michael	Co-investigators	Ontario Institute of Cancer Research (OICR) HICT Program Clinical Trial	\$544,000.00	A pilot study of BOLD MRI and FLT-PET in patients with locally advanced breast cancer undergoing neo-adjuvant chemotherapy(IMPACT).
2010- 2014	Farncombe, Troy	Co-Investigator	Ontario Research Fund	\$19,449,000.00	Ontario Network for Advanced Radiation Detectors
2011	Gulenchyn, Karen	Principle Investigator	GE Healthcare	TBD	A phase 1, Open-label study to assess safety, biodistribution and radiation dosimetry, and optimize the imaging protocol of GE180 (18F) injection, a marker of microglial activation, in healthy volunteers and subjects with relapsing and remitting multiple sclerosis (rrMS)
2011	Koff, David	Principle Applicant	Hamilton Health Sciences Diagnostic Services Research Fund	\$14,000.00	REM Research Proposal
2011	Koff, David	Principle Investigator	NSERC-CRD in participation with Agfa	\$120,000.00	Objective Quality Assessment f f Compression
2011	Noseworthy, Michael	Principle Investigator	Hamilton Health Sciences Diagnostic Services Research Fund	\$12,000.00	Renal Research Proposal
2011- 2012	Singnukar, Amit Dhamanaskar, Kavita Gulenchyn, Karen	Principle Applicant Co-applicant Co-applicant	CHAR (Canadian Heads of Academic Radiology) / GE Healthcare Research Development Grant & MRRC (McMaster Radiology Research Committee)	\$17,500.00	A pilot, single centre, prospective clinical investigation of the acceptability of a dedicated high resolution nuclear breast imaging camera (MBI) in breast imaging of patients administered Tc-99m Sestamibi (ROSE)
2011 -2014	Koff David	Co-Investigator	ORF	\$1,411,000.00	Secure Intelligent Content Delivery System for Timely Delivery of Large Data Sets in a Regional/ National Electronic Health Record
<b>Total</b>				<b>\$39,708,189.00</b>	

## RESEARCH ACTIVITY

## Diagnostic Imaging Research Committee

Hospital Funds have been supporting our DI Research Committee for a number of years. These funds will not be available going forward due to hospital budget cuts therefore we need to look for new sources to fund these internal projects. Our committee meets three times a year to review research proposals for possible funding; a member of our department must be involved in the project in order to be eligible for funding. Below is a table outlining the funds that the committee has awarded since 2008.

Below is a table outlining the funds which our committee has awarded since 2008

### DIAGNOSTIC IMAGING RESEARCH COMMITTEE - FUNDS ALLOCATED FOR RESEARCH PROJECTS SINCE 2008

YEAR	TOTAL FUNDING
2008	\$56,024.00
2009	\$20,500.00
2010	\$32,880.00
2011	\$41,000.00
<b>Total</b>	<b>\$150,404.00</b>

## Faculty Publications

*(See Appendix for complete list of publications)*

### SUMMARY OF PUBLICATIONS FOR DEPARTMENT

YEAR	RAD PAPERS/ TEXTS	RADIOLOGISTS INVOLVED	NM PAPERS/TEXTS	NM PHYSICIANS INVOLVED	RESIDENTS PAPERS	RESIDENTS INVOLVED	FELLOWS PAPERS	FELLOWS INVOLVED
2008	33	40	18	19	5	5	1	1
2009	41	61	11	12	8	8	4	4
2010	26	42	13	13	6	7	4	4
2011 (to date)	21	33	5	5	2	3	6	6
<b>Totals to date</b>	<b>121</b>	<b>176</b>	<b>47</b>	<b>49</b>	<b>21</b>	<b>23</b>	<b>15</b>	<b>15</b>

## Research Report

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

# Clinical Services and Programs





# Clinical Services and 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 continuity of care with no gap in coverage.

Over the past year, we have started to move away from the site-based expertise to an enterprise-wide concept at HHS, hoping to expand to St Joseph's 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

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### Hamilton General Hospital

- Neuroradiology and neurointerventional radiology
- Cardiac imaging
- Breast imaging
- Interventional radiology and vascular imaging

### Juravinski Hospital & Cancer Centre

- Oncology imaging
- Breast imaging
- Musculoskeletal imaging
- Cardiac imaging
- Interventional radiology

### MUMC

- Pediatric imaging
- Pediatric neuroradiology
- Pediatric and obstetrical ultrasound
- Gastrointestinal imaging
- Interventional radiology

## HHS DI MUSCULOSKELETAL IMAGING

7 Fellow trained MSK Radiologists based at the 3 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 St. Joseph's Hospital MSK Imaging Fellowship Programme.

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

## HHS DI BREAST IMAGING PROGRAM

The breast imaging program is a clinical service that includes;

- mammography
- breast ultrasound
- breast MR
- breast related interventional procedures (including stereotactic and u/s guided breast biopsies, needle localizations and ductography).
- regular rounds and meetings with pathologists, surgeons, oncologists to review active cases

The strength of the program includes;

- a dedicated group of mammography technologists who are interested in teaching residents and fellows the technical and mammography QC aspects of the program
- a dedicated group of u/s technologists who help guide and hone the u/s skills of the residents and fellows
- a dedicated group of breast imaging radiologists interested in teaching.
- the inclusion of the OBSP on the resident/fellowship program, ensuring that residents and fellows develop good screening skills as well as interventional breast procedures
- Radiology - Pathology Correlation Rounds
  - Every Monday the radiologists, pathologists, residents, fellows, mammo & u/s 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
- 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 PEDIATRIC AND 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, and to support the pediatric programs at the McMaster Children's Hospital.

The service is staffed jointly by the Departments of Radiology and Obstetrics and Gynecology. There are presently 5 obstetricians and 2 radiologists involved in high risk obstetrical ultrasound.

The service/program primarily supports the following programs;

- High Risk Obstetrics and Gynecology
- The Neonatal Intensive Care Unit
- The New Pediatric ER
- The Pediatric GI medicine and GI surgery programs
- The Pediatric Neurology and Neurosurgery programs
- The Pediatric Nephrology and Urology programs

There is a smaller general radiology and adult GI component, for the adult services that remain at MUMC and for the new Urgent Care Centre.

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, weekly Pediatric Neurology Rounds, weekly NICU rounds and monthly Radiology Urology Nephrology 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. VCUG
  - d. swallowing assessments
  - e. sinograms and fistulograms
  - f. rarely small bowel enterocolysis
  - g. defecograms
  - 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 ten 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 cross-sectional imaging fellowships offered at all three sites.

### HHS DI PAEDIATRIC IMAGING

Pediatric Imaging is performed in all imaging modalities at MUMC.

The department of radiology supports the clinical neuropsychiatric program with our new radiologists, fellowship trained in pediatric neuroradiology and with the help of specialized pediatric neuroradiologists providing call coverage remotely through teleradiology. The onsite radiologists participate in the 2 weekly neuro-oncology and pediatric neurology rounds. The program will provide teaching to pediatric neurology residents through 1-month electives.

The pediatric radiologists are also participating in the tumour boards, hemo-oncology, NICU and GI rounds and soon to come fetal imaging rounds.

We are reviewing all current imaging protocols, mainly ultrasound and CT, and are working on improving radiation safety in CT.

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

## 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.

## St. Joseph's Healthcare Department of Diagnostic Imaging

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

## SJH DI ULTRASOUND IMAGING

The program has 3 Fellow trained cross sectional Radiologists and 6 Residents rotating yearly. 4-6 elective medical students have expressed interest in US while rotating in the Department.

4-6 US technologist students are also in the program at any given time.

Site specific 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. Expanding US service for ED and IP with portable bedside US services

## SJH INTERVENTIONAL RADIOLOGY

This program has 4 Fellowship trained Interventional radiologists.

We provide dedicated 24x7 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 dedicated IR nurse and technologist on call service along with the Interventional Radiologists.

The procedures performed range from biopsy and drainage to complex embolisation, 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 embolisation 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 is a standard of committee member of the CIRA and SIR societies.

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.

## SJH DI MAMMO PROGRAM

The mammo service is based out of 2 sites, the Charlton 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.

## SJH 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 ortho-

pedics, 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. US-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.

## SJH DI COMPUTED TOMOGRAPHY

The CT department at SJH is a busy department with 2 MDCT scanners-one 64slice 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-ionising 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.

2 radiologists, 1 fellow and often 1 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.

## SJH 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 Mike Noseworthy, and clinical services. SJH MR performs approximately 14,000 exams/year

Services: 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 dept in Canada to receive ACR accreditation

The MRI department at St. Joseph's Healthcare 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

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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 - Respiriology, 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.



# Relationships and Affiliations





# Relationships and Affiliations

## AGFA HEALTHCARE

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Collaboration on projects where AGFA has been the industry partner such as Radiation Exposure Monitoring (REM) funded by NRC and Quality Assessment and Enhancement of Compressed Images funded by NSERC.

## CANADA HEALTH INFOWAY

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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.

## eHEALTH AT McMASTER UNIVERSITY – NORM ARCHER, ANN MCKIBBON

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We are in the process of creating a new stream within the eHealth Master program dedicated to teaching Imaging Informatics to students. Expected start date is September 2012.

## GE HEALTHCARE

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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.

## HAMILTON HEALTH SCIENCES

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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)

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IRC, based at St Joseph Hospital, 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

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Collaboration with the Department of Computer Sciences on such topics as automatic assessment of tumour growth has led to international publications.

## MOHAWK COLLEGE

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A 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.

## MOHAWK SHARED SERVICES - (MSS)

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MSS is a partner in projects related to the Digital Imaging Repository based at SWO, London, and has funneled funding from Infoway for projects such as assessment of feasibility of Lossy Compression.

## NATIONAL RESEARCH COUNCIL OF CANADA - (NRC)

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NRC is partnering with McMaster University and AGFA to create a nationwide radiation registry which will track individual doses and create a set of decision support tools; NRC has funded the project for more than 3 million Dollars and has provided a research team based in Fredericton, NB, to support the research.

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

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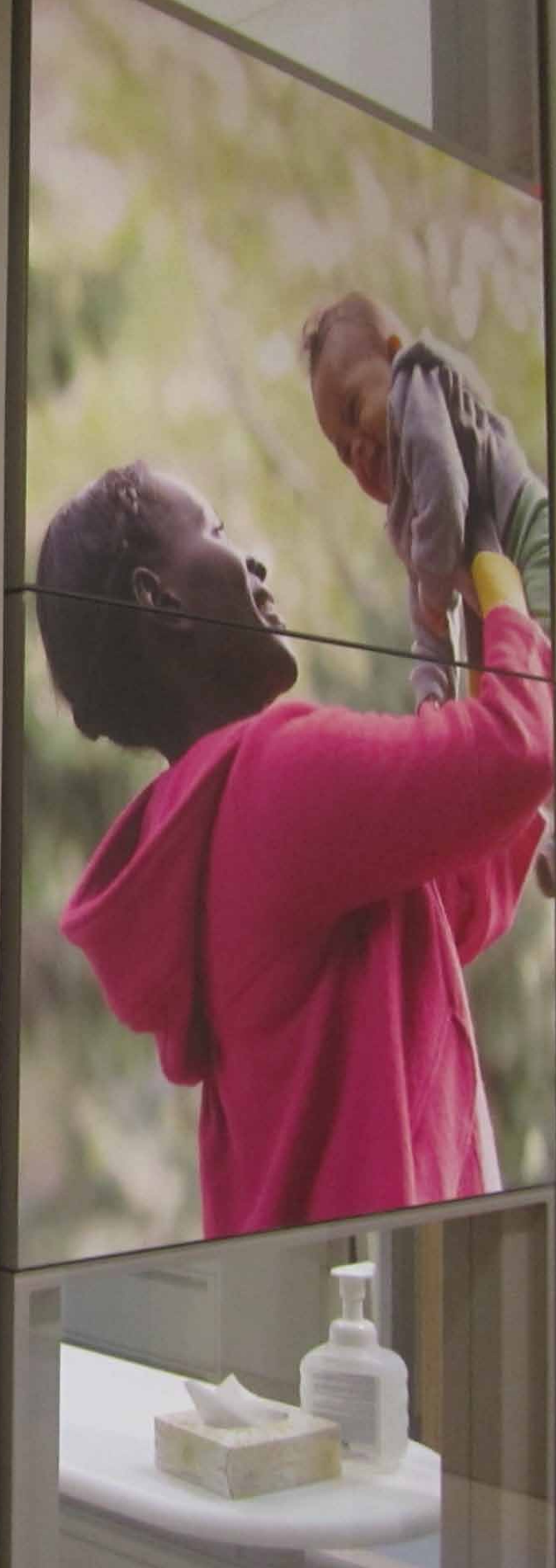
NSERC has funded a number of joint projects with University of Waterloo

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

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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.

# Strengths and Weaknesses



# Strengths and Weaknesses

## Strengths

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- A dedicated pool of radiologists who believe in their mission and work hard.
- A strong commitment to education has resulted in superb achievements in our postgraduate programs with constant excellent results for our residents and high satisfaction from our fellows.
- A new organizational structure with strong and competent administrative support, allowing for improved foundations in our program.

## Weaknesses

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- Lack of integration between the clinical sites with four distinct partnerships which don't share the same culture.
- Resistance to change which impacts our ability to move the department into a more subspecialized model. Many changes have already happened, and we are on our way to achieving the additional adaptations required to deliver a more focused service.
- The Residency Program Director is stepping down after 11 years; even if there is a succession plan in place and the new Program Director has been identified, there is always uncertainty as to the ability of the candidate to perform and deliver, and there will be a one year coaching period to make sure the new incumbent is properly trained.
- Limited interest for research among the clinicians, and lack of funding which impedes the ability to recruit motivated researchers. There is a need for start-up funds to initiate a process where the researchers will get self-funded through major grants.

## Achievements 2008 -2011

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Over the past three years, many changes have been implemented in the Department which has impacted delivery of services, education, research and interpersonal relations.

- New Governance structure with new committees supporting the Chair:
  - DRAC
  - RPC
  - Research Committee
  - T&P committee
  - CME Committee
- New positions open to enthusiastic faculty:
  - DEC
  - Program Directors
- New communication channels to remain connected with faculty at all sites
- Integration of critical clinical services.
- New annual review process
- Strategy to engage all sites in academic mission through shared key functions and balanced support for academic activities.
- Recruitment of PhD's to improve research visibility and generate more grant money.
- New research Imaging Informatics research centre and successful grant applications allowing for an increase in our research team.

# Department Goals



# Department Goals

The Department has to be prepared to address the challenges of a changing healthcare landscape, constraints related to budget limitations, an aging population and technological evolution in imaging. The radiologist's role is to promote appropriateness of imaging, limit radiation exposure.

We need to understand meaningful use and anticipate new developments. For the next 5 to 10 years, here is what the Department should consider:

Maintain our **competitive advantage in education** through a careful selection of our new program directors, working under the guidance of our former leaders, in order to preserve the high quality of our residency, undergraduate and fellowship programs. Keep our faculty, residents and fellows engaged and motivated, and achieve excellence.

**Academic Practice Plan:** to build an academic practice plan which will unite all radiologists at our four sites and nuclear medicine physicians is our first priority. The goals in achieving this change in our governance structure are:

- Create unified governance at all sites which will formalize the relationship of the radiologists and nuclear medicine physician with the University and the Hospital through an agreed upon Service Agreement.
- Facilitate the recruitment of new academic oriented radiologists/researchers without having to go through the private partnerships.
- Implement a new mechanism to support the academic activities in equalizing the contribution from all physicians working in the Department through a mechanism to be discussed.
- Introduce the idea of joining the Alternate Funding Plan which will help to repair the revenue imbalance with the radiologists practicing in community hospitals.

Implement a new **evaluation score card** to include all academic, research and clinical contributions. This evaluation will be updated each year for the annual review.

**Meaningful use:** as gatekeepers for appropriate use of imaging, we need to leverage on evidence-based find-

ings to implement the right algorithms and encourage the adoption of decision support tools. This will be facilitated by the adoption of electronic order-entry systems, in which the Institution has to invest in the coming years. Part of this trend is the need to train the upcoming generations of physicians and include meaningful use in the medical foundations where students will be exposed to appropriateness and radiation protection.

**Medical and Molecular Imaging:** technology is evolving at a fast pace with the sophistication of computer resources and the quicker ability to fuse and merge images. The combination of cross-sectional and functional imaging evidences lesions and facilitates characterization. We have seen the development of PET-CT, but we talk now of PET-MR and even new hybrid technology fusing CT, MR and PET. This is probably only the beginning and we'll see more of these combined modalities. The problem is that this involved different imaging specialties and there are few specialists trained jointly in radiology and nuclear medicine. We need to answer to this need and build a joint residency program offering training in both specialties and start training the imagers of the future.

**Foster Research:** part of what makes a successful department is the amount of research it generates. We have to build a culture of research and if busy clinicians cannot devote too much time to research, we need to bring research to the clinicians. A common mistake is to build poles of research, which remain disconnected from real life; we need to create awareness and make research part of our daily life. Ideas are like seeds, they must be collected and nurtured, if we want to see a generous crop. But experience in many academic radiology departments in North America has demonstrated that it may not be productive to impose on clinicians with little expertise to do research for the sake of research; instead, it is much more profitable to recruit individuals with a track record in research, successful at grant writing, and who can build large funded projects. This is the way we would like to go. But this implies resources, and we need to identify funding to recruit appropriately the skilled researchers who can bring projects to fruition.

# Department Publications



# Department Publications

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