Department of Medical Imaging
Annual Report 2004-2005

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CHAIR’S REPORT

This past year we moved forward with the implementation of our May 2004 Strategic Plan update. Six research teams received the first year of a two to three year departmental seed grant to enable them to move forward with their translational research programs, most of which are in collaboration with related groups in Medical Biophysics, Surgery, Radiation Oncology and Neurosciences. These areas of translational research include: advanced methods of cancer imaging and treatment, neuro-imaging, microvascular imaging, musculoskeletal imaging, minimally invasive image guided therapy, and image registration and fusion. As in the past few years, in order to achieve our goals we continued to increase the number of faculty with protected research time, principally funded from clinical practice plans, but with financial incentives from our university budget. At the trainee level, Dr. Richard Bitar, our first Resident to enroll in a Ph.D program during residency, will soon complete his Ph.D. requirements in the area of non-invasive vascular imaging. We plan to have a second Resident enroll in a Ph.D. program next year.

We continue to have strong educational programs. I am especially grateful to our Program Directors, all of whom contribute a great deal of their time towards the success of our department: Drs. Timothy Dowdell and Nasir Jaffer (Undergraduate Program), Drs. Walter Montanera and Suzanne Laughlin (Residency Program), Dr. Manohar Shroff (Fellowship Program), and Dr. Paul Hamilton (Continuing Education). At the Undergraduate level in particular, Drs. Dowdell and Jaffer made significant progress in creating a standardized spiral program for all four years of the curriculum.

Our department maintained strong support of its faculty for protected research time. This year, the faculty members with departmentally sponsored research time were:

- Dr. Mostafa Atri (Evaluation of QCT and DCE-MRI of cervical cancer perfusion and USPIO-enhanced MRI of cervical cancer lymphadenopathy)
- Dr. Petrina Causer (MRI evaluation of the contralateral breast in women with a recent diagnosis of breast cancer)
- Dr. Bairbre Connolly (Radiation dose to children and radiologist during PICC Insertions)
- Dr. Alan Daneman (Necrotizing enterocolitis: comparison of Grey scale and Doppler sonography findings with clinical radiographic and pathological findings)
- Dr. Andrea Doria (Comparative measurements of BOLD signal in experimental arthritis according to variations in the region-of-interest)
- Dr. Richard Farb (The dural worm: A sign of previous sinovenous thrombosis)
- Dr. Kartik Jhaveri (Advanced MRI techniques application (diffusion imaging and MR spectroscopy) in ovarian mass characterization)
- Dr. Roberta Jong (The ACRIN Digital Mammography Imaging Screening Trial)
- Dr. John Kachura (Radiofrequency ablation of liver tumors: Patient survival, local progression-free survival and factors for failure of effectiveness)
- Dr. Korosh Khalili (Prevalence of cecal angiodysplasia in an asymptomatic population. Multidetector CT angiography in evaluation of occult GI hemorrhage)
- Dr. Martin O’Malley (Growth rates of hepatocellular carcinoma stratified by size)
• Dr. Narinder Paul (Comparison of low dose computed tomography of the thorax (LDCTT) and minimum dose computed tomography of the thorax (MD-CTT) with chest radiography (CXR) for the detection of lung metastases in a high risk population)
• Dr. Yves Provost (CT coronary angiography)
• Dr. Dheeraj Rajan (Interventional research/Research in minimally invasive therapy)
• Dr. Heidi Roberts (Early lung cancer detection using computed tomography)
• Dr. Manohar Shroff (Is contrast really needed following a normal unenhanced CT of the brain in children?)
• Dr. Lawrence White (Quantitative T2 Mapping of Cartilage Transplantation in an Animal Model)
• Dr. Stephanie Wilson (Introduction of microbubble enhanced sonography to routine clinical practice, with cost impact analysis)

We are very proud of the excellent teaching in all of our educational programs. Every year we publicly recognize those teachers selected by our trainees as being the most outstanding. Our departmental teaching awards this year were:

Edward L. Lansdown Award for Outstanding Teaching in the Residency Training Program
• Dr. Robert Bleakney

Outstanding teaching in the residency program
• Dr. Mostafa Atri
• Dr. Edna Becker
• Dr. Robert Bleakney
• Dr. Raymond Chan
• Dr. Dae-Gyun Chung
• Dr. TaeBong Chung
• Dr. Lisa Ehrlich
• Dr. Anthony Hanbidge
• Dr. Nasir Jaffer
• Dr. Edward Kassel
• Dr. Korosh Khalili
• Dr. Matthew Lax
• Dr. Walter Montanera
• Dr. Derek Muradali
• Dr. David Salonen
• Dr. Manohar Shroff
• Dr. Harry Shulman
• Dr. Sean Symons
• Dr. Louis Wu
• Dr. Eugene Yu
• Dr. Leon Zelovitzky

Outstanding teaching in the fellowship program
• Dr. Derek Armstrong
• Dr. Mostafa Atri
• Dr. Paul Babyn
• Dr. Susan Blaser
• Dr. Peter Chait
• Dr. Dae-Gyun Chung
• Dr. Alan Daneman
• Dr. Anthony Hanbidge
• Dr. Kartik Jhaveri
• Dr. Tae Kyoung Kim
• Dr. David Manson
• Dr. David Mikulis
• Dr. Walter Montanera
• Dr. Oscar Navarro
• Dr. Martin O’Malley
• Dr. Charles Raybaud
• Dr. Manohar Shroff
• Dr. Sean Symons
• Dr. Robert Willinsky
• Dr. Stephanie Wilson
• Dr. Louis Wu

Achieved distinction for outstanding teaching in both the residency and fellowship programs
• Dr. Mostafa Atri
• Dr. Dae-Gyun Chung
• Dr. Anthony Hanbidge
• Dr. Walter Montanera
• Dr. Manohar Shroff
• Dr. Sean Symons
• Dr. Louis Wu

The academic promotions this year were (effective July 1, 2005):
  Associate Professor - Dr. Derek Muradali
  Assistant Professor - Dr. Margaret Cheng
                        Dr. Sophie Pantazi
                        Dr. Louis Wu

I would like to thank Amy Shea, Gina Sciortino, Ayethida Walker and Felomena Teixeira - the administrative staff at the university offices. Gina will be temporarily retiring this year to spend more time with her young and very active family. I will miss her greatly. Fortunately we have managed to recruit an excellent person for her job – Suzanne D’Alvise – who has now assumed the position of department business officer. I greatly appreciate the efforts of the team!

Walter Kucharczyk, M.D., F.R.C.P. (C)
Professor and Chair
Chair ................................................................................................................................................ Kucharczyk, W.
Associate Chair.................................................................................................................................. Roberts, T.

Radiologists-in-Chief

Hospital for Sick Children .................................................................................................................. Babyn, P.
Mount Sinai Hospital-University Health Network (Princess Margaret Hospital/Toronto General Hospital/Toronto Western Hospital) ........................................................................ Bret, P.
St. Michael's Hospital ....................................................................................................................... Common, A.
Sunnybrook & Women's College Health Sciences Centre .................................................................. Moody, A.

Program Directors

Continuing Education .......................................................................................................................... Hamilton, P.
Fellowship ........................................................................................................................................ Shroff, M.
Neuroradiology ..................................................................................................................................... Fox, A.
Nuclear Medicine ............................................................................................................................... Hershkop, M.
PGY1 .................................................................................................................................................. Laughlin, S.
Radiology Residency ......................................................................................................................... Montanera, W.
Radiology Residency (Co-Director) .................................................................................................... Laughlin, S.
Research ............................................................................................................................................... Roberts, T.
Undergraduate ..................................................................................................................................... Dowdell, T.
Undergraduate (Co-Director) ............................................................................................................... Jaffer, N.

Division Heads

Abdominal Imaging .............................................................................................................................. Atri, M.
Breast Imaging ....................................................................................................................................... Muradali, D.
Cardiothoracic
  Cardiac Imaging ............................................................................................................................. Merchant, N.
  Thoracic Imaging ............................................................................................................................. Paul, N.
Musculoskeletal Imaging ....................................................................................................................... White, L.
Neuroradiology ..................................................................................................................................... TerBrugge, K.G.
Pediatric Imaging ................................................................................................................................. Manson, D.
Vascular and Interventional Radiology ............................................................................................... Chait, P.

Department Administrative Staff

Business Officer ................................................................................................................................. Sciortino, G.
Administrative Assistant ..................................................................................................................... Shea, A.
Residency Program Assistant ............................................................................................................ Teixeira, F.
Research Program Assistant ............................................................................................................... Walker, A.
COMMITTEES

Executive Committee
Kucharczyk, W. (Committee Chair)
Jaskolka, J. (Chief Resident)
Babyn, P.
Bret, P.
Laughlin, S.
Common, A.
Dowdell, T.
Hamilton, P.
Hershop, M.
Jaffer, N.
Laughlin, S.
Montanera, W.
Moody, A.
Roberts, T.
Salem, S.
Shroff, M.

Promotions Committee
TerBrugge, K. (Committee Chair)
Mostafa Atri
Babyn, P.
Jaffer, N.
Rubenstein, J.
Weiser, W.
Yaffe, M.

Undergraduate Teaching Committee
Dowdell, T. (Committee Chair)
Bleakney, R.
Chawla, T.
Chung, T.B.
Deitel, W.
Jaffer, N.
Margolis, M.
Paul, N.
Sarrazin, S.
Shroff, M.

Specialty Training Committee
Montanera W. (Committee Chair)
Jaskolka, J. (Chief Resident)
David, E.
Hayeems, E.
Hershkop, M.
Laughlin, S.
MacDonald, C.
Mikulis, D.
Pearce, D
Prasad, V.
Martinovic E.
Rosta, N.
Stimec, J.
Mohktassi, A.
UNIVERSITY OF TORONTO FULLY AFFILIATED HOSPITALS AND INSTITUTES

Hospital for Sick Children ................................................................. 555 University Avenue
Toronto, Ontario
M5G 1X8

Mount Sinai Hospital ................................................................. 600 University Avenue
Toronto, Ontario
M5G 1X5

St. Michael's Hospital ................................................................. 30 Bond Street
Toronto, Ontario
M5B 1W8

Sunnybrook & Women’s College Health Sciences Centre

Sunnybrook Campus ................................................................. 2075 Bayview Avenue
Toronto, Ontario
M4N 3M5

Women’s College Campus ............................................................. 76 Grenville Street
Toronto, Ontario
M5S 1B2

University Health Network

Princess Margaret Hospital ............................................................ 610 University Avenue
Toronto, Ontario
M5G 2M9

Toronto General Hospital .............................................................. 585 University Avenue, NCSB
Toronto, Ontario
M5G 2N2

Toronto Western Hospital .............................................................. 399 Bathurst Street
Toronto, Ontario
M5T 2S8

Centre for Addiction and Mental Health ........................................ 250 College Street
Toronto, Ontario
M5T 1B8

Positron Emission Tomography Centre ........................................... 250 College Street
Toronto, Ontario
M5T 1B8
<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Division</th>
<th>Hospital</th>
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<tr>
<td>Alton, D.J.</td>
<td>Assistant Professor</td>
<td>Pediatric Imaging</td>
<td>Hospital for Sick Children</td>
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<td>Arenson, A.M.</td>
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<td>Nuclear Medicine</td>
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<td>Ho, C.S.</td>
<td>Professor</td>
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<td>University Health Network</td>
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<td>Associate Professor</td>
<td>Cancer Imaging</td>
<td>Centre for Addiction and Mental Health</td>
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<td>Nuclear Medicine</td>
<td>St. Michael’s Hospital</td>
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<td>Ibach, K.</td>
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<td>Loucks-Gray, T.</td>
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<td>Rowlands, J.A.</td>
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<td>Rubenstein, J.D.</td>
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<td>Salem, S.</td>
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<td>Salonen, D.C.</td>
<td>Assistant Professor</td>
<td>Musculoskeletal Imaging</td>
<td>University Health Network</td>
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</tbody>
</table>
### Sarrazin, J. Assistant Professor Cardiothoracic Imaging Sunnybrook & Women’s College Health Sciences Centre
### Shroff, M. Assistant Professor Neuroradiology Hospital for Sick Children
### Shulman, H.S. Professor Cardiothoracic Imaging Sunnybrook & Women’s College Health Sciences Centre
### Simons, M. Assistant Professor Vascular Imaging University Health Network
### Smith, R. Assistant Professor Neuroradiology University Health Network
### Sniderman, K.G. Professor Vascular Imaging Sunnybrook & Women’s College Health Sciences Centre
### Sussman, M. Assistant Professor Research University Health Network
### Sussman, S. Lecturer Cardiothoracic Imaging University Health Network
### Symons, S. Assistant Professor Neuroradiology Sunnybrook & Women’s College Health Sciences Centre
### Tan, K.T. Assistant Professor Vascular Imaging University Health Network
### Temple, M. Assistant Professor Pediatric Imaging Sunnybrook & Women’s College Health Sciences Centre
### TerBrugge, K.G. Professor Neuroradiology University Health Network
### Thomas, K. Assistant Professor Abdominal Imaging St. Joseph’s Health Centre
### Thurston, W. Assistant Professor Abdominal Imaging Mount Sinai Hospital
### Toi, A. Associate Professor Pediatric Imaging Sunnybrook & Women’s College Health Sciences Centre
### Traubici, J. Assistant Professor Musculoskeletal Imaging Sunnybrook & Women’s College Health Sciences Centre
### Turner, D. Assistant Professor Abdominal Imaging University Health Network
### Wall, J. Lecturer Abdominal Imaging St. Michael’s Hospital
### Weisbrod, G.L. Professor Cardiothoracic Imaging Sunnybrook & Women’s College Health Sciences Centre
### Weiser, W.J. Professor Cardiothoracic Imaging University Health Network
### White, L. Associate Professor Musculoskeletal Imaging Mount Sinai Hospital
### Willinsky, R.A. Professor Neuroradiology University Health Network
### Wilson, S.R. Professor Abdominal Imaging University Health Network
### Wood, M.L. Professor Research/Medical Biophysics Sunnybrook & Women’s College Health Sciences Centre
### Wright, B.E. Assistant Professor Breast Imaging Sunnybrook & Women’s College Health Sciences Centre
### Wu, L. Assistant Professor Abdominal Imaging Sunnybrook & Women’s College Health Sciences Centre
### Xiang, J. Assistant Professor Research/Medical Biophysics Hospital for Sick Children
### YaFe, M.J. Professor Research/Medical Biophysics Sunnybrook & Women’s College Health Sciences Centre
### Yao, S-J. Professor Pediatric Imaging Sunnybrook & Women’s College Health Sciences Centre
### Yu, E. Lecturer Neuroradiology University Health Network
### Zalev, A.H. Assistant Professor Abdominal Imaging St. Michael’s Hospital
### Zelovitzky, J.L. Assistant Professor Cardiothoracic Imaging University Health Network

### Cross Appointments

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<tr>
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<tr>
<td>Bronskill, M.J.</td>
<td>Professor</td>
<td>Medical Biophysics</td>
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<td>Foster, S.</td>
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<td>Freedom R.</td>
<td>Professor</td>
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<td>Henkelman, R.M.</td>
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<td>Johnson, J.A.</td>
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<td>Obstetrics and Gynaecology</td>
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<td>McLaughlin, P.R.</td>
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<td>Medicine</td>
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<td>Noyek, A.M.</td>
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<td>Pharaoah, M.J.</td>
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<td>Surgery</td>
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<td>Vanek, I.</td>
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<td>Ophthalmology</td>
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### Radiation Sciences Program (Joint Program with Michener Institute)

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<td>Babiak, C.</td>
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<td>Cornacchione, P.</td>
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<td>King, D-M.</td>
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<td>Watson, T.</td>
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<td>Wong, B.</td>
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THE DEPARTMENT OF MEDICAL IMAGING AND THE UNIVERSITY OF TORONTO TEACHING HOSPITALS

The academic programs in the Department of Medical Imaging are integrated with its five major teaching hospitals: the University Health Network (UHN), Mount Sinai Hospital (MSH), St. Michael’s Hospital, Sunnybrook & Women’s College Health Sciences Centre, and the Hospital for Sick Children. The medical imaging departments at UHN and MSH are consolidated into a single operational unit under the leadership of Dr. Patrice Bret. The Medical Imaging departments at St. Michael’s Hospital, Sunnybrook & Women’s College Health Sciences Centre, and the Hospital for Sick Children are led by Dr. Andrew Common, Dr. Alan Moody, and Dr. Paul Babyn.

University Health Network/Mount Sinai Hospital

Recruitment remains a priority for the Department, both for technologists and for radiologists. Our largely international fellowship program continues to contribute a number of outstanding radiologists from outside Canada to our Faculty, which in turn increases the pool of Canadian radiologists. As part of the MOH initiatives around waiting lists, some funding has been made available to Medical Imaging to reduce the waiting lists in MRI. This has allowed to complete the 24/7 coverage on most of the units and resulted in a significant decrease of the waiting list. At the same time, reorganization of the CT modality has allowed to also reduce the waiting list to a point where it now meets the benchmark standards for almost every indication. A large number of our faculty members continue to have time protected for academic work. Their work is more fully described in the Research Director’s report. Significant events and accomplishments include very major renovations at Toronto Western Hospital, which created a virtually brand new facility. This opened with redesigned space and new imaging equipment including a 3T MRI, new neuroangio equipment, and a gamma knife, providing a unique environment for the treatment of neurological disorders. PMH has a PET/CT scanner but access remains unavailable to most patients because funding is only available within a few supported clinical trials. This continues to be a handicap for Princess Margaret Hospital and to our Department – our recruitment efforts of a PET expert are severely hampered by lack of funding for PET studies.

Sunnybrook and Women’s College Health Sciences Centre

The Sunnybrook and Women’s College Health Sciences Centre Medical Imaging Department is comprised of 6 divisions - Body Imaging, Neuroradiology, Cardiothoracic/VIR, Nuclear Medicine, Musculoskeletal and Breast Imaging, supporting major regional programmes including Oncology, Trauma, Burns and Stroke. The Department is research driven, encouraging hypothesis generated clinical research and collaboration with the adjacent department of Research Imaging. Access to state-of-the-art research equipment including 3T MRI, 1.5T MRI and PET-CT complement clinical twin speed MRI’s (2), 3 CT scanners and fully equipped nuclear medicine, angiography and ultrasound departments. The Department is fully integrated with PACS and RIS systems. For further information regarding clinical or research imaging please contact alan.moody@sw.ca.
St. Michael’s Hospital

The Medical Imaging Department at St. Michael's Hospital has undergone considerable remodeling in the past few years. A Siemens PACs system with integrated voice recognition technology has been installed, and electronic work-listing will soon render the department paperless, with markedly improved reporting efficiency. The annual tally of imaging examinations is over 250,000, excluding a very busy cardiac catheterization service which performs over 4000 radiologist-interpreted procedures per year. Virtually all of the imaging equipment has been replaced, with three helical CT scanners (including two new 64-slice units), three new 1.5 Tesla MRI units, and three angio suites, including a bi-plane neuro interventional facility. An aggressive recruiting campaign of sub-specialist radiologists has brought full-time staffing levels to 18 which has allowed the department to better meet the needs of the University Residency and Fellowship Programs. St. Michael’s is proud of its long-standing commitment to teaching and clinical excellence. The hospital has appointed a renowned Critical Care researcher as VP of Research, and there is renewed commitment to increasing the research profile of the hospital. A new state-of-the-art research building will soon be built. Other unique hospital attributes which are reflected in the Medical Imaging Department at St. Michael’s are the Inner City Health Programme, and the Hereditary Hemorrhagic Telangiectasia Program. St. Michael’s has recently been designated as a Centre of Excellence for Vascular Surgery, with a cooperative endovascular stent-graft program shared between Medical Imaging and Vascular Surgery. Our Neurointerventional Service has grown rapidly in the last few years, and will continue to do so as we expand our activities as a Regional Stroke Center. The Breast Imaging service has recently moved into a new CIBC Breast Centre on the same floor as the Medical Imaging Department. Further, St. Michael’s is downtown Toronto’s helipad-serviced trauma centre, and lithotripsy centre, and has outstanding clinical and research programs in renal disease, and in heart and vascular diseases, which are actively supported by the Medical Imaging Department.

Hospital for Sick Children

The Hospital for Sick Children Department of Diagnostic Imaging provides full imaging service for all children up to the age of 18 years. We currently perform approximately 140,000 examinations per year. The department has 23 full-time and part-time staff, in all pediatric imaging subspecialties. The department has two 1.5T MR scanners, two CT scanners, (including one 8 slice CT), along with a dedicated Image Guided Therapy suite. This suite allows both Interventional radiology and minimally invasive surgical procedures to be combined, and consists of four rooms containing integrated CT fluoroscopy, a biplane unit, and two single plane fluoroscopic units with ultrasound units. The department has an active sonography service with eleven ultrasound units. There is an integrated PACS and RIS system providing image and report distribution throughout the department and the hospital. Research and sub-specialty training are active interests of the department with three imaging scientists and seventeen fellows in subspecialty training from across the world.
RESEARCH GRANTS

Members of the Department of Medical Imaging (underlined) were investigators on the following grants, identified by the principal investigator, other investigators, project title, sponsor, total amount of grant, and start and end dates of the funding period.


Banwell B (Principal Investigator), Shroff M (Radiologist for study). Neuropsychological and MRI characteristics of pediatric multiple sclerosis – Creation of MRI criteria for pediatric MS. CIHR. CAD 4.5 million. 2003 – 2008.

Bassett A (Principal Investigator), Mikulis DJ (Co-Investigator). Delineating a high risk phenotype in familial schizophrenia. Canadian Institutes of Health Research (CIHR). $140,000.00/yr. April 2002-March 2007.


Cheng M. (Principal Investigator). The Chair’s Startup Fund. Department of Medical Imaging, University of Toronto. $5,000. 2005.


Connolly B, Swoboda N. Radiation Dose to Children in an Interventional Program. Research & Development: Dept of Medical Imaging, University of Toronto. $8,000. April 1, 2004 – March 31, 2005.


Fox_ AJ - Advisor to CIHR Judging Panel, Multi-Centre Trials, Aneurysm Treatment Research, winter 2005.

Fox_ AJ - Director, Angiographic Core Lab for Cerecyte (aneurysm coiling) Trial, from fall 2004.

Fox_ AJ - Grant reviewer, Heart and Stroke Foundation of Canada, Aneurysm Treatment Research, fall 2004.

Fox_ AJ - Grant reviewer, CIHR, Aneurysm Treatment Research, fall 2004

Haider MA (Principal Investigator), Toi A, Sweet J, O’Malley M, Trachtenberg J (Co-Investigators). The utility of functional and morphologic MRI in the detection of prostate cancer for patients with elevated PSA and prior negative biopsy. PMH Foundation. $30,000.00. April 2002 (on-going).

Haider MA (Principal Investigator), Langer D, Toi A, Menard C, Trachtenberg J (Co-Investigators). Advanced prostate imaging. Granting Agency: Dept. of Medical Imaging Research Program Grant, Faculty of Medicine, University of Toronto. $70,000.00. 2005-2007.


Hurtig MB, White LM, Marks PH (Principal Investigators), Buschmann M, Shirazi S, Dickey J, Weller I, Mohtadi NG (Collaborators). Risk factors and indicators that predict the progression of osteoarthritis after knee injury. Canadian Institutes of Health Research (CIHR), and the Institute of Musculoskeletal Health and Arthritis (IMHA). $1,500,000.00 (CIHR New Emerging Team NET Grant; Quality of Life Enhancement Competition 2004). 2004-2009.


Jong RA - Screening Breast Ultrasound in High Risk Women Berg, W (PI) (Toronto Site Principle Investigator) Avon Foundation & National Institutes of Health 2004 – 2007 - ($240,000 (US$) for Toronto site


Kim TK (Principal Investigator), Jang HJ (Co-Investigator). A phase III open label multicenter trial to compare the diagnostic accuracy of definity®-enhanced ultrasound imaging versus contrast enhanced CT for characterizing liver lesions. Bristol-Myers Squibb. $50,000.00 USD. 2004-2005.


Lehman C (PI), Causer P. - MRI Screening of the Contralateral Breast ACRIN 6667. NIH ($55,000 to our centre). Co-investigator (P.I.) 2003-2006


Macgowan C (Principal Investigator), S-J Yoo, MD (Co-Applicant). MRI Assessment of Pulmonary Hemodynamics within the Lungs. Canadian Institutes of Health Research (Operating Grant). $212,279. 2004/10 – 2007/09


Mikulis DJ (Co-Principal Investigator). The behavioral research and imaging network. Grant Support (BRAIN #01-MAR-0936). Ontario Research and Development Challenge Fund. $95,000.00/yr. 2002-2007.


Paul N (Principal Investigator) Multidetector 64 slice CT coronary angiography in patients referred for cardiac surgery: correlation with coronary angiography. Granting Agency: Canadian Association of Radiologists. CHAR Award. $6,000.00. April 2005.


Shroff M (Principal Investigator). Neuroplasticity in Pediatric Stroke. Department of Medical Imaging, University of Toronto. $35,000. 2004 – 2005.

Shroff M (Principal Investigator). The Need for Contrast in Pediatric Head CT. Department of Medical Imaging, University of Toronto. $8,000. 2003 – 2004.


Wright G (Principal Investigator), Merchant N (Co-Investigator). Magnetic resonance imaging for ischemic heart disease. Canadian Institutes of Health Research (CIHR). $135,240.00 per year + equipment x 4 years (2003-2007).
PUBLICATIONS: PEER–REVIEWED PAPERS AND ABSTRACTS


Crean A, Merchant N. Role of cardiac magnetic resonance imaging in identification of amyloid cardiomyopathy. Indian Heart J November-December 2004;56(6):683-686. (Letters to the Editor)


Fanning N, Laffan E, Shroff M. Serial diffusion-weighted magnetic resonance imaging correlated with clinical course and treatment response in children with intracranial pus collections: accepted for publication in Pediatric Radiology, June 2005.


Yoo SJ. What does an increased atrial-to-ventricular length ratio mean in fetuses with atrioventricular septal defect? Ultrasound Obstet Gynecol. 2004 November;24:597-598.


PUBLICATIONS: NON-PEER–REVIEWED, BOOKS, CHAPTERS

Atri, M. – Chapter: Pocket Radiology, Gynecology Top 100 Diagnosis. Ed: Hricak, Reinhold, Ascher. 10 of 100 Diagnosis were prepared.


Babyn P. Teaching Atlas of Pediatric Radiology (IN PREPARATION)


Patsios D, Weisbrod G, Tsao MS, de Perrot M. Epithelioid angiosarcoma of the lung: A rare late complication of lucite plombage. (Case Report)


INVITED PRESENTATIONS AND VISITING PROFESSORSHIPS


Armstrong D Pathologic Appearances in Skulls and Spines. The Michener Institute, April 15, 2005.


Babyn P. Musculoskeletal System Imaging. The University of Western Ontario – London. October 22, 2004

Bartlett ES, Walters TD, Symons SP, Fox A.J. (SRA) - Identification of Carotid Near Occlusion by CT Angiography. ASNR 2005 Program

Bartlett ES, Walters TD, Symons SP, Fox AJ (SRA) - Validity of Millimeter Carotid Stenosis CT Angiography Measurements for Endarterectomy

Bartlett ES, Symons SP, Fox AJ. (SRA) - Cross-Sectional Mm2 Area of Carotid Stenosis CT Angiography

Bartlett ES, Walters TD, Symons SP, Fox AJ (SRA) - Direct CT Angiographic Measurements of Vessels Alleviates Cumbersome Estimates for Ratio Calculations

Blaser S Neuroimaging features of the inborn errors of Metabolism. Society for Inborn Metabolic Disorders. Annual meeting at Asilomar, Monterey California, March 6-9, 2005.


Blaser S Role of MRI in Neonatal HIE. Womens College Hospital, Department of Neonatology, Toronto June 24, 2004


Chait P. RSNA Refresher Course Presentations, Chicago, Illinois. November 2004 (1)Techniques of Invasive Sonography (Hands-on workshop) (2)Venous Access (Hands-on Workshop)


Charron M. Co-Moderator, Interpretation of Infrequently Performed Pediatric Nuclear Medicine Procedures – Includes Adult Diseases Presenting in the Pediatric World Session Type: SNM Continuing Education. Society Nuclear Medicine 52nd Annual Meeting, June 20, 2005, Toronto, ON, Canada.


Cheng HLM. Magnetic resonance imaging for characterizing the microcirculation. 17th Annual MRI Retreat, Gibraltar Point Retreat Centre, Toronto, Canada, September 2004.

Cheyne D. Spatial filtering approaches to neuromagnetic source reconstruction. Santa Fe Source Reconstruction Symposium; Bishop’s Lodge, Santa Fe, NM, USA, June 2005.
Cheyne D. Dipole modeling versus event-related SAM: Effects of correlated brain activity. Symposium on Spatial Filtering in Biomagnetism, 14th International Conference on Biomagnetism; Boston, USA, August 2004.

Connolly B. Canadian Society of Pediatrics Workshop in Montreal: Nutritional rehabilitation of the pediatric patient with special needs in the community. Connolly B, Telch J, Issenmann R. June 2004


Connolly B. IGT; clinical role. First ever Pediatric Interventional Radiology Symposium. Conference organizer & host with Dr. M. Temple, The Hospital for Sick Children, November 2004


Daneman A. Intussusception: an update on diagnosis and management Radiology residents:
interesting case review. Visiting Professor, Yale University School of Medicine. New Haven, Connecticut, May 12-13, 2005


Fanning NF, Walters TD, Symons S, Fox, A.(C) - Relationship between Carotid Artery Bifurcation Calcification and White Matter Changes


Fox AJ - CTA Replaces Carotid Stenosis Quantification from DSA. France-Israel Association of Radiology, Eilat, Israel, Oct. 2004

Fox AJ - a) Vascular anatomy and radiologic pearls in stroke diagnosis; b) Neuroimaging and stroke diagnosis, workshop with A Demchuk, invited Speaker. Canadian Stroke Consortium, Neurology Residents’ Stroke Course, Mar 2005, Toronto

Glanc P, MD, FRCP(C), Toronto, ON; Salem S, MD; Farine D, MD, FRCS; Khalifa M, MD - Exhibit ID: E242; Title: Maternal Adnexal Masses: A Diagnostic and Management Challenge. American Roentgen Ray Society 2005, New Orleans, May 15-20 2005.

Glanc P, D Koff, M Dunn, G Elliott, A Volkening, S Marafioti. - Exhibit ID: E371; Title: Implementation of a Web-Enabled Neonatal Unit Teleradiology Network


John P. Renovascular Hypertension. Pediatric Workshop, SIR 2005

Jong R. - Surveillance of High Risk Women - American Society of Breast Disease’s 29th Annual Symposium, Las Vegas, Nevada April 14-16, 2005

Jong R – a) Mammographic Masses and Asymmetries, b) Problem solving with Supplementary Mammographic Views and Ultrasound, c) Screening MRI: When is it Justified? d) Ultrasound-Guided Core Biopsy, e) Digital Mammography: A Better Vision
Breast Imaging Update 2004 - Montreal, Quebec, August 20-22, 2004

Kachura JR. Tumor management (Moderator); Embolization (hands-on workshop); Angioplasty/stents. Canadian Interventional Radiology Association, 3rd Annual Meeting. Mont Tremblant, Quebec, Canada. September 9-10, 2004.


Kachura JR. Tumor ablation with radiofrequency, cryotherapy or microwave systems (hands-on workshop). Society of Interventional Radiology, 30th Annual Scientific Meeting. New Orleans, Louisiana, USA. April 2, 2005.
Kachura JR. Percutaneous RF (radiofrequency)-what is and is not possible; Lunch Symposium: Interventional radiologic management of hepatobiliary problems (Moderator). American Hepato-Pancreato-Biliary Association, Annual Meeting. Fort Lauderdale, Florida, USA. April 14-17, 2005.


Kachura JR. Radiofrequency ablation (hands-on workshop); Embolization with Nester coils; Renal artery angioplasty; Radiofrequency ablation [Moderator]; Interventional oncology - an overview; RFA (radiofrequency ablation) of liver - cases; RFA - kidney; Morbidity and mortality cases. Canadian Interventional Radiology Association, 4th Annual Meeting. Deerhurst Resort, Huntsville, Ontario, Canada. June 9-11, 2005.


Manson D. Emergency Room Films That You Love to Hate. Paediatric Update 2005, The Hospital for Sick Children, Department of Paediatrics, University of Toronto Conference Centre, May 2-7, 2005.


Navarro O. June 29, 2004, Pediatric abdominal imaging with emphasis on neonatal gastrointestinal pathology. Kingston, Ontario, Queen’s University, Resident Teaching Rounds.


Navarro O. November 9, 2004, MRI of pediatric bone marrow, Santiago, Chile, Department of Radiology, Pontificia Universidad Católica de Chile.


Ranson M. September 27, 2004, Imaging of pediatric MSK infection, Toronto, ON, 19th Annual Organ Imaging Review, Dept. of Medical Imaging, University of Toronto


Temple M. First Pediatric Interventional Radiology Symposium, Conference Organizer & Host with Dr. B. Connolly, The Hospital for Sick Children, November 2004.


TerBrugge K. The veno-architecture spectrum of intracranial dural AVFs, its clinical correlations and indications for endovascular treatment; Angioarchitectural analysis and hemorrhagic risk recognition of brain AVMs; Partial-targeted and palliative embolization of brain AVMs; The spectrum of intracranial AVMs in children; Natural history, indications, techniques, and results of endovascular treatment of incidentally detected and of symptomatic, non ruptured aneurysms; Local intra-arterial fibronolysis: indications, territories, techniques, results and outcome. 13th Zurich Course on Interventional Neuroradiology. Zurich, Switzerland. March 11-14, 2005.

Thomas K. Ionising radiation in pediatric imaging - a risk;benefit balance. Pediatric Update Conference, Toronto, May 2005


Traubici J. September 29, 2004, Renal Cystic Disease, Toronto, ON, 19th Annual Organ Imaging Review, Dept. of Medical Imaging, University of Toronto


Wilson S. Visiting Professor. Right lower quadrant pain; Not always acute appendicitis; Sonographic evaluation of the patient with AIDS; The adnexal mass: Is it malignant or is it


Wu L. Department of Radiology, McMaster University. Cardiac MRI. Hamilton, December 2004.


Yoo, S-J. September 30- October 1, 2004. (1) “Pediatric cardiovascular MR, overview” (2) “MR evaluation of pulmonary circulation” (3) “Postoperative MR evaluation of congenital heart disease” (4) “Fetal cardiac screening”. Visiting Professor to Cincinnati Children’s Hospital

Yoo, S-J. November 11, 2004. “What’s new in pediatric cardiology” Sejong Heart Institute, Pucheon, Korea


Yoo, S-J. November 16, 2004. “MR evaluation of pulmonary circulation disorders” Yonsei University Hospital, Seoul, Korea

Yoo, S-J. November 16, 2004. “Future trends of pediatric cardiac imaging” Samsung Cheil Hospital, Seoul, Korea

Yoo, S-J. November 17, 2004. “Normal cardiac anatomy for imaging” Seoul National University Hospital, Seoul, Korea

Yoo, S-J. November 17, 2004. “Research cardiac MR projects at the Hospital for Sick Children in Toronto” Samsung Medical Center, Seoul, Korea

Yoo, S-J. December 1, 2005. “Case-based review, Pediatric, Cardiovascular” RSNA, Chicago
Yoo, S-J. January 21, 2005. “CMR versus CT for vascular anomalies” Society for Cardiovascular MR Annual Congress, San Francisco

Yoo, S-J. January 24-27, 2005. (1)“Normal cardiac anatomy for imaging” (2) “Sequential segmental analysis of congenital heart disease” (3) “Postoperative MR evaluation of congenital heart disease” (4) “Plain film interpretation of congenital heart disease” (5) “MR evaluation of pulmonary circulation” (6) “Evaluation of aortic arch anomalies” Visiting Professor to Lucile Packard Children’s Hospital, Stanford University, Palo Alto


Yoo, S-J. March 30-April 1, 2005. (1) “Normal cardiac anatomy for imaging” (2) “Sequential segmental analysis of congenital heart disease” (3) “Practicums” 3rd Society for Pediatric Radiology Symposium on Pediatric Cardiovascular MR. Toronto


Zalev AH. Series of GI Lectures. Queen’s University. Kingston, April 6-8, 2005.

Altaf N, Daniels L, Beech A, Gladman J, Morgan PS, MacSweeney ST, Moody, AR and Auer DP. Magnetic Resonance Direct Thrombus Imaging of the carotid plaque is associated with increased thromboembolization. ISMRM Miami 2005.


Aviv RI, Farb RI, Scott J, Willinsky RA, TerBrugge KG - ATECO MRV of the venous system. RSNA November 2004

Aviv RI, Farb RI, Scott J, Willinsky RA, TerBrugge KG - Variations of the intracranial venous system on ATECO MR venography. RSNA November 2004 (computer exhibit)

Aviv RI, Benseler SM, deVeber GA, Tsang LM, Tyrell PN, Armstrong D - The appearance and correlation of MRI and MRA in primary CNS vaculitis of childhood, BSNR Cambridge, September 2004


Bartlett E.S., Symons SP, Fox AJ. (SRA) - Cross-sectional mm² area of carotid stenosis CT angiography. ASNR, May 2005, Toronto, ON, Canada.


Bartlett E.S., Walters T.D., Symons S.P., Fox A.J. (SRA) - Direct CT angiographic measurements of vessels alleviates cumbersome estimates of ratio calculations. ASNR, May 2005, Toronto, ON, Canada.

Bartlett E.S., Walters T.D., Symons S.P., Fox A.J. (SRA) - Validity of millimetre carotid stenosis CT angiography measurements for endarterectomy. ASNR, May 2005, Toronto, ON, Canada.


Blaser SL. Radiologic findings in children who have hearing loss: New findings on MRI of the brain in association with MRI of the temporal bone. Nalli Day, University of Toronto, February 17, 2005


Cartwright L, Farhat W, Sherman C, Chen J, Yeger H, Babyn P, Cheng HLM. Tissue engineered bladder neovascularization is enhanced with VEGF and quantifiable with dynamic contrast-enhanced MRI. 52nd Annual James C. Kimbrough Urological Seminar; Honolulu, USA, January 2005


Chan RP. Radiology of the Pelvis and Genitourinary System. Year 1 Medical students, Radiological Anatomy Lecture Series. Faculty of Medicine, University of Toronto, September 29, 2004, Toronto, Ontario.


Cheng HLM, Purcell CM, Bilbao JM, Plewes DB. Contrast kinetics for improved prediction and assessment of thermal necrosis. 5th Interventional MRI Symposium; Boston, USA, October 2004.

Cheng HLM, Wright GA. Rapid T1 mapping by variable flip angles: analytic expression for B1-error influences and optimization for large T1 range. 13th Scientific Meeting of the International Society of Magnetic Resonance in Medicine; Miami, USA, May 2005.


Fanning NF, Walters TD, Symons S, Fox A (C) - Relationship between carotid artery bifurcation calcification and white matter changes. ASNR, May 2005, Toronto, ON, Canada.


Gasparini FF, Navarro O, Dasgupta R, Gerstle T, Thorner P, Manson DE. Ileocolic intussusception causing duodenal obstruction mimicking the imaging appearance of malrotation complicated with volvulus. Dublin, Ireland, 42nd Annual Congress of the European Society of Pediatric Radiology, June 1, 2005


Itier RJ, Herdman AT, Picton TW, Taylor MJ. Inversion and contrast-reversal effects on early face processing assessed by MEG. BioMag, Boston, USA, August 2004.


John P. A 6-Year Review of Interventional Pediatric - Infants (less than 1.5Kg): Complications, Lesson Learning & Current Practice. 42nd Annual Congress of the European Society of Pediatric Radiology 2005

John P. Image Guided Drainage of Multiple Intravenous. 42nd Annual Congress of the European Society of Pediatric Radiology 2005

John P. Image Guided Percutaneous biopsy/bone and soft tissue lesion in Children. 42nd Annual Congress of the European Society of Pediatric Radiology 2005

John P. Image Guided Therapy of Pulmonary Lesions in Children. 42nd Annual Congress of the European Society of Pediatric Radiology 2005


Koff D, Townend C - Applied Health Informatics Bootcamp, University of Waterloo, Waterloo, Ontario, July 17-22, 2005, Continuing Medical Education Director - “Major Healthcare Applications 2: Digital Imaging and PACS”


Laffan EE, Manson DE, Daneman A. H-Type tracheo-oesophageal fistulae: are tube oesophagrams needed for diagnosis? The European Society of Pediatric Radiology, Dublin, Ireland, May 30-June 3, 2005.


Levine DS, Navarro OM, Chaudry G, Blaser S. Imaging the complications of Bone Marrow Transplantation in children. 42nd ESPR Congress, June 1st - 3rd 2005, Dublin

Malik O, Roncaroli F, Quest R, Aviv RI - Lesion evolution using Apparent diffusion coefficient in a patient with Balo’s concentric sclerosis. ASNR, Toronto, May 2005

Manson D. Congenital Anomalies of the Lung. Organ Imaging Review Course, Department of Medical Imaging, University of Toronto, Toronto, Ontario, September 29, 2004


Moody AR, Crossley, I, Moorby, S. - Delay Magnetic resonance direct thrombus imaging as a first line investigation of pulmonary embolism - results of the PDQ trial. RSNA 2004


Comparison to intercranial discharges over the epileptogenic zone. Presented at Biomag 2004, Boston Massachusetts. August 8-12, 204.


Parmar H, Papsin B, Unger S, Blaser S. Petrified Ears in a Case of Keutel Syndrome: Imaging Findings SENTAC, Toronto, December 2-5, 2004


Propst J, Blaser S, Gordon KA, Harrison RV, Papsin BC. Temporal Bone Findings on Computed Tomography Imaging in Branchio-Oto-Renal Syndrome. 42nd ESPR Congress, June 1st - 3rd 2005, Dublin


Wu L. Cardiac MRI: A Primer with CMART. Annual Meeting, PEI. June 2005.


Zalev AH. Imaging of small bowel Crohn’s disease at the start of the 21st century. 2nd Canada Israel Medical Conference. November 15, 2004, Tel Aviv, Israel.

Zalev AH, Deitel WL. Capsule endoscopy findings in patients with established and suspected small bowel Crohn’s Disease: correlation with radiological and endoscopic findings. SGR Meeting. February 27 –March 3, 2005, San Antonio, Texas.

AWARDS AND SPECIAL RECOGNITION

Babyn PS, Chu WC, Tsou IYY, Wansaicheong GKL, Allen U, Britnun A, Chee TSG, Cheng FWT, Chiu MC, Fok TF, Hon EKL, Gahunia HK, Kaw GJL, Khong PL, Leung CW, Li AM, Manson D, Metreweli C, Ng PC, Read S, Stringer DA. Walter E. Berdon Award for Best Clinical Paper, Society of Pediatric Radiology, New Orleans, 2005

Babyn P. Excellence in Teaching – Department of Medical Imaging Fellowship Program. University of Toronto. July 1, 2004 – June 30, 2005


Chung T, Culham G, Yoo SJ. Presidential Recognition Award. Annual Meeting of the Society for Pediatric Radiology.

Daneman A. Outstanding teacher in the Fellowship Program. University of Toronto, Dept. of Medical Imaging Award 2004-2005

Daneman A. The Jack O. Haller Award for Excellence in Teaching. 2005 Grant Awards from the SPR Research and Education Foundation presented at the 48th Annual Meeting of the Society for Pediatric Radiology. New Orleans, Louisiana, May 4-7, 2005


Manson D. Outstanding Teacher in the Fellowship Program 2004-2005, as selected by the Fellows.

Navarro O. Outstanding Teacher in the Fellowship Program. University of Toronto, Dept. of Medical Imaging Award. Academic Year: July 1, 2004 to June 30, 2005

RESEARCH PROGRAM

Research and education are the two pillars of academic medicine. Our department places equal emphasis on both. With respect to research, in the broadest sense, our research endeavors span the entire spectrum of scientific inquiry - from basic science to clinical trials. However, our focus is on translational and clinically applied research – imaging research whose results are intended to be applied in the clinic within 1-5 years. Our research program is jointly led by Andrea Kassner, PhD, and David Mikulis, MD - our Acting Research Program Co-Directors.

Research is an important mission of the Department of Medical Imaging. Many of the faculty, residents, and fellows in the Department devote considerable effort to research. The Department supports research through several projects depending on the interest and expertise of individuals and on resources at particular hospitals. Furthermore, several dedicated research faculty with appointments in Medical Imaging at each of the affiliated hospitals collaborate with the Department to help comprise a massively diverse research program.

A synopsis of the key initiatives is presented below. Also included below are the research grants and publications of the faculty who are not listed with one of the affiliated hospitals.

The Faculty Research Award

The Department provides support to allow a small number of radiologists to devote 50% of their time to research, while retaining the other half for clinical duties. The following radiologists are supported through this initiative:

- Dr David Mikulis (TWH)
- Dr Masoom Haider (PMH)
- Dr Naeem Merchant (TGH)
- Dr Alan Moody (SWCHSC)
- Dr Shi-Joon Yoo (HSC)

The Medical Imaging Research and Development Awards

The Medical Imaging Research and Development Awards is an initiative intended to allow a select group of clinical radiologists with a strong research interest to devote at least one day each week to a defined research project. The radiologists listed in the table below were awarded the Medical Imaging Research and Development Awards in 2004-2005.
<table>
<thead>
<tr>
<th>Award Holder</th>
<th>Award Period</th>
<th>Hospital</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alan Daneman</td>
<td>1/4/2004 – 31/3/2005</td>
<td>HSC</td>
<td>Necrotizing Enterocolitis: Comparison of grey scale and Doppler and sonography findings with clinical radiographic and pathological findings</td>
</tr>
<tr>
<td>Andrea Doria</td>
<td>1/7/2004 – 30/6/2005</td>
<td>HSC</td>
<td>Comparative measurements of BOLD signal in experimental arthritis according to variations in the region-of-interest</td>
</tr>
<tr>
<td>Kartik Jhaveri</td>
<td>1/7/2004 – 30/6/2005</td>
<td>UHN/MSH</td>
<td>Advanced MRI techniques application (diffusion imaging and MR spectroscopy) in ovarian mass characterization</td>
</tr>
<tr>
<td>Roberta Jong</td>
<td>1/1/2003 – 31/3/2005</td>
<td>SWCHSC</td>
<td>The ACRIN Digital Mammography Imaging Screening Trial</td>
</tr>
<tr>
<td>John Kachura</td>
<td>1/7/2004 – 30/6/2005</td>
<td>UHN/MSH</td>
<td>Radiofrequency ablation of liver tumors: Patient survival, local progression-free survival and factors for failure of effectiveness</td>
</tr>
<tr>
<td>Martin O’Malley</td>
<td>1/7/2004 – 30/6/2006</td>
<td>UHN/MSH</td>
<td>Growth rates of hepatocellular carcinoma stratified by size</td>
</tr>
<tr>
<td>Narinder Paul</td>
<td>1/7/2004 – 1/9/2005</td>
<td>UHN/MSH</td>
<td>Comparison of low dose computed tomography of the thorax (LDCTT) and minimum dose computed tomography of the thorax (MD-CTT) with chest radiography (CXR) for the detection of lung metastases in a high risk population</td>
</tr>
<tr>
<td>Yves Provost</td>
<td>1/7/2004 – 30/6/2006</td>
<td>UHN/MSH</td>
<td>CT Coronary Angiography</td>
</tr>
<tr>
<td>Dheeraj Rajan</td>
<td>1/7/2004 – 30/6/2006</td>
<td>UHN/MSH</td>
<td>Interventional Research/Research in minimally invasive therapy</td>
</tr>
<tr>
<td>Heidi Roberts</td>
<td>1/7/2004 – 30/6/2006</td>
<td>UHN/MSH</td>
<td>Early lung cancer detection using computed tomography</td>
</tr>
<tr>
<td>Manohar Shroff</td>
<td>1/7/2004 – 30/6/2005</td>
<td>HSC</td>
<td>Is contrast really needed following a normal unenhanced CT of the brain in children?</td>
</tr>
<tr>
<td>Lawrence White</td>
<td>1/7/2004 – 30/6/2006</td>
<td>UHN/MSH</td>
<td>Quantitative T2 mapping of cartilage transplantation in an animal model</td>
</tr>
<tr>
<td>Stephanie Wilson</td>
<td>1/7/2004 – 30/6/2005</td>
<td>UHN/MSH</td>
<td>Introduction of microbubble enhanced sonography to routine clinical practice, with cost impact analysis</td>
</tr>
</tbody>
</table>
Multidisciplinary Research Program – Translational Research Grant

The final results of this year's competition for Seed Grant funding as part of our departmental initiative to build our multidisciplinary research programs are as follows:

- Dr. Mostafa Atri - Ultrasound Assessment of Tumor Perfusion
- Dr. Andrea Doria - Pediatric Musculoskeletal Imaging
- Dr. Masoom Haider - Advanced Prostate Cancer Imaging
- Dr. Roberta Jong - Breast Imaging Research
- Dr. Manohar Shroff - Neuroimaging and Plasticity in the Immature Brain
- Dr. Lawrence White - Cartilage Imaging and Characterization

In addition, Dr. Alan Moody has been awarded funding from the same pool for a summer student for his research program on Imaging Vascular Biology.

All awardees are expected to write a peer-reviewed grant by the end of this calendar year, and to be successful with their grant applications by the end of 2006.

RSNA Roentgen Resident/Fellow Research Award

The RSNA Research and Education Fund offers this Award annually to recognize and encourage outstanding residents and fellows in radiology research. Each year the director of the residency program or the department chair will nominate an individual based on publication and presentation of scientific papers, receipt of research grants or successful contributions to the departmental research program. In 2005, Eric Bartlett, MD received this award for his significant academic and research contributions to neuroradiology.

Research Day

Annual forum for highlighting research accomplishments, which was held on April 21, 2005. It consisted of presentations from senior residents, the faculty who received the Medical Imaging Research and Development Awards, and many other members of the department. An excerpt from the Program for Research Day is included at the end of this section.

Positron Emission Tomography Centre, Centre for Addiction and Mental Health

The Vivian M Rakoff Positron Emission Tomography (PET) Centre under the direction of Dr Sylvain Houle, located at the Centre for Addiction and Mental Health, fosters multidisciplinary research within the University of Toronto neuroscience community. The PET Centre is part of the University Functional Imaging Research Network (FIRN) and the provincial BRAIN research network. The intramural research at the PET Centre itself is focused on basic research in PET methodology (radiochemistry, neuroscience and physics) and in clinical application of PET to the understanding and treatment of mental disorders (schizophrenia, depression and aging) and addiction.
The PET Centre has recently developed a new selective PET radioligand for the serotonin transporter which is now being applied to the study of selective serotonin reuptake inhibitors (SSRIs) used to treat depression. Even though SSRIs have been prescribed for the treatment of depression in millions of patients but, up to now, it had not been possible to directly measure its effect in the brain. This new tracer, [C-11] DASB, is new being adopted by other leading PET research centres worldwide.

Another research programme within the PET Centre explores the role of the dopamine system in schizophrenia. Although the effects of antipsychotic medications are known to be linked to their effects on the dopamine system, very little is known about their actual mechanism of action in the brain. New insights in the role of the dopamine system have been obtained by closely linking human findings obtained with PET with those obtained from animal research. This approach is already providing clinical benefits in the treatment of schizophrenia by providing objective means of optimizing existing treatments and by offering new avenues for the development of more effective drugs.

**Imaging/Bioengineering Research, SWCHSC**

Imaging research is a major focus of the Imaging/Bioengineering Research group at Sunnybrook and Women’s College Health Sciences Centre (SWCHSC). Scientists in this group have University of Toronto appointments in the Department of Medical Biophysics, or the Department of Medical Imaging, or both. The faculty in this group make use of exceptional resources for research at SWCHSC and conduct research involving x-ray, nuclear medicine, magnetic resonance, and ultrasound technology. This group is internationally recognized for its excellent graduate student program.

**Image Guided Minimally Invasive Therapy (IGMIT)**

This research program has received large extra-mural grants from Technology Ontario, the Canadian Foundation for Innovation, the ORDCF, and from the commercial sector. It is part of the University of Toronto wide collaborative program "Functional Imaging Research Network" (FIRN), and the Ontario wide collaborative programs, Ontario Consortium for Image Guided Surgery (OCITS), and the Imaging Network of Ontario (INO).

The IGMT project has been in existence since 1995. The principal investigator is Dr. Walter Kucharczyk. There are many co-investigators and collaborators, especially in Neurosurgery under the leadership of Dr. Mark Bernstein, and in Medical Biophysics under the leadership of Dr. Mike Bronskill. The main thrust of this research program is the development and clinical implementation of multi-parametric imaging that demonstrates anatomic, physiologic, and functional tissue characteristics, with subsequent use of these multi-parametric tissue maps for image guidance in minimally invasive and surgical procedures. Much of the initial work has focused on open-concept MRI systems and the brain. Components of this project include image processing and analysis, neuro-navigation, pulse programming, thermometry, surface coil development, robotics, and MRI compatible surgical tools.
Downtown Imaging Physics Group

Research scientists from the Department of Medical Imaging's affiliates: The University Health Network and the Hospital for Sick Children comprise this core group of imaging physicists and scientists in the downtown sector. Research areas focus on clinical translation and include but are not limited to Magnetic Resonance Imaging (MRI) physics, physiologic specific imaging, clinical applications in MRI, Dynamic CT, functional MRI and Magnetoencephalography (MEG) mapping methods as well as investigations in sensory and cognitive function. Individual projects of this group are briefly outlined below:

Projects by Andrea Kassner, PhD – UHN

1. Prediction of hemorrhage in acute ischemic stroke using permeability MRI

Increased risk of intracranial hemorrhage limits the general use of tissue plasminogen activators (t-PA) in acute ischemic stroke (AIS). Preliminary results of this study shows that early blood-brain-barrier (BBB) defects in AIS can be assessed using quantitative DCE MRI. Significantly increased permeability was found in 3 cases which later on hemorrhaged. This method has potential to identify patients at higher risk of HT and may allow to use physiological imaging rather than time from onset of symptoms to guide the decision to treat with t-PA. This work has resulted in 1 paper, several abstracts and a successful grant application (CIHR).

Collaborators: David Mikulis, Tim Roberts

2. Tissue classification in brain tumors

Physiological MR imaging including diffusion (to assess tumor cellularity), dynamic contrast-enhanced (DCE) MRI (to assess blood volume and microvascular permeability related to angiogenesis) and spectroscopy (to assess metabolism) offer insights into aspects of tumor physiology and metabolism, thus allowing characterization of tumor dysfunction. These techniques will assist with tumor grading as well as surgical planning and monitoring of cancer related therapies. Furthermore the use of combinatorial approaches such as factor analysis may yield even higher specificity in determining prognosis and treatment response. Software developments for this project are ongoing.

Collaborators: James McCurdy, Adrian Crawley, David Mikulis

3. Assessment of cerebral vascular reactivity (CVR)

Combining CO₂ manipulation with BOLD MRI is a promising for assessing regional differences in cerebrovascular reactivity (CVR) which is a measurement of the brains autoregulatory capacity which is important for the assessment of vascular disorders in which autoregulation is compromised or exhausted. Since this technique is beginning to be used pre-operatively to guide surgical decision making and to assess efficacy of revascularization, knowledge concerning reproducibility and gender differences are essential. This work has resulted in several abstracts, 1 submitted paper.
Although the magnitude of the BOLD signal is primarily employed to assess the reactivity of the cerebral vasculature, the temporal delay of the BOLD response can be assessed and may contain useful information concerning blood transit times. We have calculated the time delay differences between vascular territories of the anterior, middle, and posterior cerebral arteries as well as white compared to overall grey matter, which were in line with what authors have reported previously for DSC imaging. This resulted in 2 abstracts and one manuscript.

**Collaborators:** Adrian Crawley, Julien Poublanc, David Mikulis

4. **Imaging of angiogenesis in experimental arthritis**

Juvenile idiopathic arthritis is a chronic disease that may impair any joint of the body. It produces inflammation of the synovium, which is a highly vascularized membrane that overlies the bones at the joints. The inflamed synovium in arthritis erodes the adjacent cartilage and bone. The sooner the arthritis is treated, the milder is the progression of the disease. Although conventional imaging modalities exist to evaluate the degree of inflammation and degeneration of the articular cartilage, such as anatomic magnetic resonance imaging, they are unable to depict articular changes before the joint is destroyed. In this study we plan to induce arthritis in rabbit knees and to determine whether functional magnetic resonance imaging such as permeability or BOLD imaging is able to monitor the response of the joints to treatment using non-steroidal antinflammatory drugs and a technique of continuous movementation of the rabbit legs by means of a machine which is called continuous passive motion.

**Collaborators:** Andrea Doria, Tim Roberts, Adrian Crawley, Margaret Chen

5. **Metabolic and hemodynamic effects of cross-linked hemoglobin**

Hemoglobin-based-oxygen-carriers (HBOC) are being developed as a substitute for human blood to replace blood loss and ensure adequate oxygen delivery. Vasoconstriction limits the effectiveness of HBOC. To reduce the vasoconstrictor response the NO and O2 affinity and diffusivity of HBOC have been modified. The effect of these HBOC on intrarenal pO2 and blood flow distribution is not known. We therefore aim to develop methods for quantitating intrarenal blood flow and hemoglobin oxygenation following infusions of HBOC in a rat model. Renal deoxyHb levels will be rapidly assessed during and subsequent to HBOC injection using BOLD-MRI. Renal blood flow will be quantified with dynamic MRI (Gd-DPTA injection). Blood pressure will be monitored with an MRI compatible transducer. Hb content of cortex and medulla will be measured at the end of experiments. Optimization of the dynamic imaging protocol is ongoing.

**Collaborators:** Andrew Baines, Mike Noseworthy

6. **DTI in brain tumours (FDi)**

Diffusion tensor imaging identification and characterization of white matter tracts according to the direction and degree of anisotropic water diffusion within them. Quantifying the degree of
anisotropy in terms of the quantity, fractional anisotropy, or FA offers insight into white matter development and degradation, for example in the presence of infiltrating cerebral neoplasm. Additionally, white matter tractography or fiber tracking based on the same data acquisition allows descriptive delineation of white matter fiber paths and their potential displacement by mass lesions.

With a view to quantifying the intactness of white matter in the vicinity of tumor, we define a quantity $FD_i$, or fiber density index, as an indicator of the density of white matter fibers within the bundle passing through a single pixel or region of interest. We have correlated this measure with the related quantity, fractional anisotropy. This work resulted in 2 abstracts and 1 paper.

Collaborators: Fang Liu, Tim Roberts

**Projects by Adrian Crawley, PhD – UHN**

1. *fMRI studies*

Apart from the autobiographical memory and pain studies listed as publications below, I have been a co-investigator responsible for the fMRI component of a study concerning possible cognitive decline in some breast-cancer patients undergoing chemotherapy. Our fMRI study of a working memory task has shown differences in the anterior cingulate cortex in patients self-reporting cognitive problems. The PI is Dr. Ian Tannock (PMH), who has now applied to major funding agencies on the basis of our preliminary results.

Furthermore, I am involved in the assessment of methods to analyze multiple subject fMRI data in the presence of task-correlated motion. This project is a continuation of previous work that used power spectrum and histogram methods to identify the amount of task-correlated motion in single-subject fMRI data. I have now completed an analysis of how motion that is task-correlated within individual fMRI scans is often sufficiently random in phase across subjects that a random-effects analysis of multiple-subject data does not usually require the addition of motion regressors at the individual-subject level of analysis. I am about to write these results up in terms of a full mixed-effects analysis.

2. *Assessment of changes in oxygen extraction in hypoxic tumors with 100% O2 inhalation*

We are currently scanning tumour patients using BOLD and spin labelling sequences during controlled changes in pCO2 and pO2 using a gas delivery system developed by Dr. Fisher’s lab. One goal of this project is to evaluate whether the vasodilative effects of increased pCO2 improve the supply of radiosensitizing O2 to hypoxic tumours, or whether normal tissue dilates preferentially and steals blood flow from the tumour. My main involvement is to establish the feasibility of using the BOLD measurements to measure whether hypoxic tumours can extract the additional oxygen supplied during 100% O2 inhalation. Under these conditions, normal tissue demonstrates a reduced venous dHb concentration (relative to breathing room air) detectable by the BOLD sequence. We anticipate that it should be possible to detect increased oxygen extraction in hypoxic tumours as an absence of the normal BOLD contrast.
Collaborators: Cynthia Menard, Joe Fisher, Dave Mikulis, Julien Poublanc, Andrea Kassner

3. **Voxel-based morphometry (VBM) studies**

I was significantly involved in a VBM project looking at atrophy in the sensorimotor system of spinal cord injured subjects. The absence of atrophy in primary motor cortex (assessed using VBM and also manual morphometry of the hand representation area in M1) was reported in a paper listed below. A second paper detailing positive results in S1 that correlate with performance deficits has recently been submitted.

I have established an ongoing collaboration with Dr. Eva Chow (CAMH) to perform a variety of VBM studies to complement the manual morphometry studies (conducted by Dr. Kabani’s lab) on subjects with VCFS (a genetic deletion syndrome that predisposes individuals to schizophrenia). One of our summer students is about to submit for publication a VBM comparison of schizophrenic vs non-schizophrenic VCFS subjects.

**Projects by Marshall Sussman, PhD - UHN**

1. **Motion compensation – SIMNAV**

The first area of my research deals with the development of techniques for motion compensation. This technique is known as the SIMNAV method. The advantage over conventional methods is that it uses the image data itself, rather than external devices such as ECG, to correct for motion. As a result, it is potentially more accurate and robust than conventional motion compensation methods. An additional advantage is that this approach may be applied to any type of motion. As a result, there are a broad range of applications. To date, we have explored the applications of cardiac imaging and the assessment of joint kinematics with this technique. Other areas, such as abdominal and neuro imaging, are planned for the future. In the past year, this work has resulted in 1 abstract and 1 paper.

Collaborators: Jim Li, Larry White

2. **T2 Mapping**

A second area of interest is T2 mapping in cardiac imaging. To date, we have successfully implemented at UHN a T2 mapping pulse sequence, as well as T2 mapping post-processing software. The T2 value of tissue can potentially provide information in a broad range of disease processes. At the present time, we are using it to assess the state of the myocardium in patients with cardiomyopathies, patients with iron overload disease, and to quantify blood oxygen level. Utilizing these techniques, we are about to participate in an international multi-centre trial regarding T2 mapping and iron quantification in the heart and liver (TCRN – Thalassemia Clinical Research Network).

We have also implemented a T2 mapping pulse sequence to evaluate the degeneration of cartilage in surgically-treated horse knees. This project was carried out under funding provided by a Canadian Arthritis Foundation (CAN) grant. T2 maps were obtained from a total of 10
horse knees. At the present time, a manuscript is being prepared. We have also begun some investigations into more sophisticated T2 mapping techniques, employing multi-exponential T2 decay. This was the focus of a co-op student project. Data analysis is under way.

3. Diffusion-weighted imaging of cartilage

Since cartilage is relatively thin (~2-3mm), high-resolution images are required. This presents a significant challenge for conventional diffusion-weighted imaging techniques such as single-shot EPI (SS-EPI). SS-EPI is sensitive to off-resonance effects, which gives rise to image warping and blurring. As a consequence, we have begun to explore the use of a new pulse sequence, diffusion-weighted (DW) PROPELLER to cartilage. DW-PROPELLER is a multi-shot fast spin echo technique. Preliminary results have demonstrated significantly less off-resonance sensitivity than conventional SS-EPI. In the past year, this work has resulted in 1 abstract publication.

**Collaborators:** Larry White et al.

4. Surgical navigation

In surgical procedures, one must often navigate through the body based on information contained within previously acquired medical images. A major challenge associated with this task is correlating the information contained within the images with the actual coordinate system of the body. For this project, a surgical navigation system has been developed which tracks the position of surgical instruments during the surgical procedure via an infrared camera. This tracking information is displayed graphically and in real-time on top of the previously-acquired images. This allows the surgeon to directly correlate the surgical and image coordinate systems. This navigation system has been used successfully in brain biopsy procedures, as well as lymph node excisions from the abdomen. In the past year, this work has resulted in 1 abstract publication.

**Collaborators:** Walter Kucharczyk et al.

5. Catheter steering

Endovascular procedures performed under fluoroscopic guidance often require the use of metal guidewires for steering catheters along their desired paths. The use of metal guidewires in interventional MRI is rendered problematic due to RF resonant heating of conductive metals in the MR environment, and by susceptibility artifacts. This project deals with the development of techniques for non-guidewire catheter steering. These involve the application of electric currents to the catheter, and relying on Lorentz forces to torque the wire in the presence of the main magnetic field associated with MRI. The main issues currently being addressed are the design, characterization, and optimization of the catheter design. In the past year, this work has resulted in 2 abstract publications. A manuscript is being prepared based on this work.

**Collaborators:** Fabio Settecase, Tim Roberts, Walter Kucharczyk
6. Miscellaneous

I am also involved in various other miscellaneous projects. These include the development of novel data acquisition strategies (Spiral-PR), the development of real-time MR techniques, the development of motion tracking algorithms, the development of parallel imaging methodologies, and the investigation of novel diffusion-weighted imaging strategies. In total, this work has resulted in 3 papers, and 3 abstracts.

Projects by Chris Macgowan, PhD - HSC

My primary interest and contributions involve the development of unique real-time measurements of blood flow using MR. I have developed new acquisition and processing methods to measure the velocity spectrum of blood. Unlike Doppler ultrasound, MR-based methods do not need an acoustic window to the vessel, allowing radiologists to conveniently and accurately assess flow in large thoracic vessels. Also, these real-time methods do not require ECG gating and so are not affected by arrhythmia. In addition, I developed a processing method to improve the accuracy of peak velocity measurements. These are used to estimate pressure gradients across stenotic valves and vessels, a clinical measure of stenotic severity. I have also designed methods of measuring the pulse-wave velocity in real-time, a parameter related to vascular compliance. It is known that the mechanical properties of vessel walls, such as compliance, provide an indication of vascular function that may not be anatomically evident. Changes in vascular compliance are associated with diseases such as atherosclerosis, hypertension, and the Marfan syndrome. Collectively, these contributions are helping guide the field of quantitative flow measurement.

Recent work in my lab has detailed the behaviour of injected contrast agents as they pass through the pulmonary system of children with congenital heart disease. This information has enabled higher quality angiograms to be obtained from these patients. Such anatomical information complements the physiological blood-flow information described above to provide a more complete picture of cardiovascular pathology. Recent publications from this work etc. are listed below.

Collaborators in Medical Imaging: Shi-Joon Yoo, Marshall Sussman

Magaret Chen, PhD - HSC

My primary research interest is functional MRI of the microcirculation and cell-specific imaging, involving basic physics research on MRI methodologies and applications research both in animal models of disease and in clinical trials. My two primary applications research foci are:

1. quantitative MRI of neovascularization in tissue-engineered urinary bladder in a rabbit model using novel contrast agents
2. MRI of anti-angiogenic cancer treatment in a mouse model
In conjunction with these studies are basic physics developments for rapid, accurate, quantitative MRI. These include 3D, high-resolution T1-mapping for tissue characterization and localization of MR contrast agents. More specific to microvessel functional imaging are acquisition and analysis methods for dynamic contrast-enhanced MRI (DCE-MRI). Recent progress includes reliable imaging of blood signal during the passage of contrast agent, and improved understanding of sources of inaccuracy in current models of contrast uptake. Future efforts will focus on developing more accurate analysis models and rapid imaging methods to provide reliable, quantitative assessment of microcirculation function and its modulation in various clinical settings. This research resulted in multiple abstracts and publications (see below).

Projects by Douglas Cheyne, PhD - HSC

My research is focused on the development of neuro-imaging methods using Magnetoencephalography (MEG) – a new imaging technology that monitors brain function non-invasively, by detecting small magnetic fields produced by neural activity. We use mathematical models to localize the generators of the measured fields to produce images of activity patterns throughout the brain. This neuromagnetic imaging method has applications in the diagnosis of abnormal brain activity in disorders such as childhood epilepsy, as well as aiding in the localization of various functional cortical areas prior to surgery. Our laboratory is developing new analysis methods for the application of neuromagnetic imaging to the study of various sensory, motor and cognitive processes and their impairments in adults and children. Our goal is to provide new tools for the study of basic and higher brain function in health and disease.

Projects currently underway include: mapping the organization of auditory and somatosensory and language areas in children; measuring cortical oscillatory activity associated with somatosensory stimulation and movement; studies of motor inhibition in childhood disorders such as ADHD; neuromagnetic imaging of motor cortex function in children with cerebral palsy; and localization of neural activity associated with visuomotor integration. Selected publications from this work are listed below.
Faculty List – non-clinical
(Academic Rank as of June 30, 2005)

- Timothy Roberts   Professor        Director, Research Program, UHN
- John A. Rowlands  Professor        Senior Scientist, SWCHSC
- Martin J. Yaffe   Professor        Senior Scientist, SWCHSC
- Sylvain Houle     Associate Professor Director, PET Centre
                   Centre for Addiction and Mental Health
- Douglas Cheyne    Associate Professor Senior Scientist, HSC
- Curtis B. Caldwell Assistant Professor Physicist, SWCHSC
- Adrian Crawley    Assistant Professor MR Physicist, UHN
- Andrea Kassner    Assistant Professor Scientist, UHN
- Christopher MacGowan Assistant Professor Scientist, HSC
- Marshall Sussman  Assistant Professor MR Physicist, UHN
- George Tomlinson  Assistant Professor Biostatistician, UHN
- Margaret Cheng    Assistant Professor MR physicist, HSC
- Andrei Damyanovich Assistant Professor MR physicist, UHN
Grants

Members of the Department of Medical Imaging (underlined) were investigators on the following grants, identified by the principal investigator, other investigators, project title, sponsor, total amount of grant, and start and end dates of the funding period.


Bitar R – CHAR/Amsterdam Health Development Award, First Canadian Recipient, $12,000.

Caldwell CB, Mah K, and Poon I. “Effect of the use of FDG-PET/CT and automated image segmentation on observer variation in target volume delineation”. National Cancer Institute, Canada 2005-2006


Caldwell CB, Mah K, Turksen IB, Ung YC, Danjoux CE, Ehrlich LE – Principle Investigators. “A Fuzzy logic expert system for radiation targeting” Philips Medical Systems, Inc. $125,000/year (2 years total) 2004-2005


chemotherapy for breast cancer: an exploratory case-controlled study, 2004-2005

Crawley A – Co-investigator. CIHR Operating Grant, PI: L deNiil. Neuroimaging studies of auditory processing in individuals who stutter, $82,344 pa 2004-2009

Crawley A – Co-investigator. CIHR Operating Grant, PI: E Chow. 22q11 deletion syndrome: Children at high risk for psychiatric disorders, 2005-2008


Henkelman RM (Principal Investigator), Bronskill MJ, Burns PN, Foster FS, Plewes DB, Rowlands JA, Wright GA, Yaffe MJ. NCI Canada (Terry Fox Program Project) “Medical Imaging for JA Cancer” $1,425,844 pa 07/2001 – 06/2006

Kasap SO, Rowlands JA. NSERC (Strategic Grant) “Direct Conversion Flat Panel X-ray Image Detectors for Medical Imaging” $C 87,500 pa 10/2002 - 10/2005


Kassner A – Principle Investigator. “Can stabilization of the blood brain barrier be achieved in ischemic endothelium using corticosteroids: an MRI permeability study in a rodent model of acute ischemic stroke.” Dean’s Fund (University of Toronto, Faculty of Medicine). $ 10,000 (total), 2005-2006


Kassner A – Principle Investigator. “Stabilization of the blood-brain-barrier (BBB) will delay progression of BBB defects: a permeability study in a rat model using MRI” Project date: UHN Medical Imaging Excellence and Research Award. $ 30,000, 2005-2006

Macgowan C – Co-Applicant. Heart and Stroke Foundation (Grants-in-Aid), PI: G Cohen. Left Ventricular Mass Regression Following Stentless and Stented Aortic Valve Replacement: Follow up of a Randomized Trial, $89,350 (total), 2004/07 – 2006/06

Macgowan C – Principle Investigator. Canadian Institutes of Health Research (Operating Grant), Co-Applicant: S-J Yoo. MRI Assessment of Pulmonary Hemodynamics within the Lungs, $212,279 (total), 2004/10 – 2007/09

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Oram-Cardy J. CIHR Post-Doctoral Fellowship, $47,500 stipend plus $3,500 pa, 2003-2005

Roberts, TPL. Canada Research Chair in Imaging Research. $500,000. 1/2002-12/2006


Rowlands JA (Principal Investigator), Robert N, Fort S. Image Guided Optimisation of X-ray Cardiac Angiography, Canadian Institutes of Health Research (Operating Grant), $C 75,121, 01/10/2002 – 30/09/2005

Rowlands JA, + 9 Co-applicants, Imaging Research Centre for Cardiac Interventions, Ontario Innovation Trust, $C 6,109,294 total, 06/2002 - 06/2005

Rowlands JA – Co-Investigator (Wright G, PI) Ontario R&D Challenge Fund “Cardiac Imaging Centre of Excellence (Cardiac Flat Panel Imagers)” $C 3,118,244 pa 01/2001 - 12/2005


Zhao W, Rowlands JA, Street R, National Institutes of Health “Flat panel x-ray imaging detector with avalanche gain” $US 350,000 pa 08/2003 - 06/2008

Publications

Members of the Department of Medical Imaging (underlined) are also members of the Research Division.


Arslan MC, Caldwell CB, Turksen IB. Comparison of FCM clustering with crisp k-mean clustering in radiation treatment planning for non-small cell lung carcinoma J Nuclear Medicine 2005; 46(5) p.462P.


Gaetz W, Cheyne D. Localization of sensorimotor cortical rhythms induced by tactile stimulation using spatially filtered MEG. Neuroimage. 2005 Dec 1; [Epub ahead of print]


Books or Book Chapters


Abstracts and Scientific Presentations


Cheng HL, Wright GA. Rapid T1 Mapping by Variable Flip Angles: Analytic Expression for B1-error Influences and Optimization for large T1 Range. 13th Scientific Meeting of the ISMRM. Florida, May 2005


Cheng HL, Purcell CM, Bilbao JM, Plewes DB. Contrast Kinetics for Improved Prediction and Assessment of Thermal Necrosis. 5th Interventional MRI Symposium, Boston Oct 2004


Hunt D, Rowlands JA. The use of avalanche multiplication to eliminate noise in a-Se based flat panel x-ray detectors in the application of fluoroscopy. Young Investigators' and Image-Guided Therapy Symposium organized by The Great Lakes Chapter of the American Association of Physicists in Medicine (AAPM) held at London Regional Cancer Centre, November 2004. **15 young investigators participated in the symposium and Dylan received the Young Investigators Prize.**


Kassner A, Poublanc J, Mikulis D, Crawley A. Mapping autoregulatory capacity using BOLD MRI and alternating state levels of pCO$_2$ - a reproducibility study. 11$^{th}$ Annual meeting of the Organization for HBM. Toronto, June 2005.


Mikulis D, Kassner A, Rowan S, Silver F. Acute ischemic stroke magnetic resonance imaging: rapid assessment of anatomy, hemorrhage, penumbra, major vessels, and early defects in the blood-brain-barrier. 43$^{rd}$ Annual Meeting of the ASNR. Toronto, May 2005.


**Patents**


Roberts TPL, Cavagna F, “Biliary acid compounds for MRI determination of microvascular permeability”, WO 01/82974 A2, issued July 2004

Roberts TPL, Flagg E, Sussman MS, “A device to eliminate coil displacement artifacts from parallel MRI”, patent pending (filed 11/2003)

JA Rowlands, Wei Zhao, “An Indirect Flat-panel Detector with Avalanche Gain” (disclosure filed 2003)

Sussman MS, Merchant N, Wright GA, White LM. Method for Motion Correction in Magnetic Resonance Imaging Based on Selecting Data from the Similarity of Direct Navigator Echoes, (disclosure filed, 2004)
Invited Presentations

Kassner A.  Beyond perfusion: assessment of cerebral vascular reactivity using BOLD MRI. University of Illinois, Chicago, July 2005

Kassner A.  Biological Imaging of Brain Tumors. 2nd Rostoker Lecture, University of Toronto, November 2004.


Teaching - Hours of Lectures

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Students</th>
<th>Residents, Fellows, Faculty</th>
<th>Technologists</th>
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<tr>
<td>C.B. Caldwell</td>
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<td>S. Houle</td>
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<td>T.R. Roberts</td>
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<td>J.A. Rowlands</td>
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<td>M.L. Wood</td>
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<td>M.J. Yaffe</td>
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<td>A. Kassner</td>
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<td>C. Macgowan</td>
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<tr>
<td>M. Sussman</td>
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Department of Medical Imaging - Annual Research Day 2005

Date: Thursday, April 21, 2005
Location: Sadowski Auditorium, 18th Floor, Mount Sinai Hospital
Starting Time: 12:00 pm with welcome by Tim Roberts

**Neuroimaging**
Session Chair: Tim Roberts

12:05 PM  Noel Fanning  Association between calcification of the cervical carotid artery bifurcation and white matter ischemia
12:13 PM  David Mikulis  Detection of parenchymal hemorrhage in acute ischemic stroke: CT vs EPI gradient echo MRI
12:21 PM  Elaime Martinovic  Perfusion Abnormalities in “Benign” Developmental Venous Anomalies
12:29 PM  Elissa Flagg  The developmental trajectory of hemispheric language dominance in autism: MEG results
12:37 PM  Fang Liu  Fiber Density Index Correlates with Reduced Fractional Anisotropy in White Matter of Patients with Glioblastoma
12:45 PM  Andrea Kassner  Prediction of hemorrhagic transformation in acute ischemic stroke using dynamic contrast-enhanced permeability MRI
12:53 PM  Jing Xiang  Volumetric localization of epileptic activities in tuberous sclerosis using synthetic aperture magnetometry
1:01 PM  Julien Poublanc  Estimation of blood transit time differences through pCO2 manipulation with BOLD MRI in different cerebral vascular territories
1:09 PM  Nasim Maleki  Improved SNR using complex subtraction in Flow-sensitive Alternating Recovery (FAIR) perfusion imaging
1:17 PM  Patrick McVeigh  Unsupervised classification of multiparametric MR images of the brain: Comparison of Fuzzy C-Means and ISODATA algorithm performance

**Vascular and Interventional Radiology**
Session Chair: Peter Chait

1:27 PM  Angela Ho  Adverse Reactions to Iodinated Contrast Media: Comparing Iohexol to Iodixanol
1:35 PM  Daniele Wiseman  Bleeding complications of Left Versus Right Percutaneous Transhepatic Biliary Drainage Catheters
1:43 PM  Dheeraj K. Rajan  Ultrasound Imaging in Uterine Artery Embolization Patients: Pre-Procedure Evaluation and Post-Procedure Findings
1:51 PM  Harpreet Baweja  Experience with the Jostent Peripheral Stent-Graft in Peripheral Vascular Injuries
1:59 PM  Fabio Settecase  Endovascular catheter steering by remote control for interventional MRI
2:07 PM  J. Robert Beecroft  Transplant Renal Artery Stenosis: Outcome following Percutaneous Intervention
2:15 PM  Jeff Jaskolka  Pathologic analysis of radiofrequency ablation of pulmonary metastases in humans – preliminary experience
2:23 PM  John Kachura  Efficacy of uterine artery balloon occlusion and embolization in pregnancies complicated by placenta percreta and placenta previa
2:31 PM  John Kirby  Management of Primary Post-Partum Hemorrhage with Uterine Artery Embolization
2:39 PM  Richard Bitar  3D-High resolution Magnetic Resonance Direct Thrombus Imaging (hiresMRDTI) of atherosclerotic complicated plaque
## Abdominal Imaging
Session Chair: Mostafa Atri

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<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
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<tbody>
<tr>
<td>3:15 PM</td>
<td>Hyun-Jung Jang</td>
<td>Enhancement Patterns of Nodular Hepatocellular Carcinoma on Contrast-enhanced Ultrasound – Contribution of Delayed Phase Evaluation</td>
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<td>3:23 PM</td>
<td>Jessica Murphy-Lavallee</td>
<td>Are Metastases Really Hypovascular in the Arterial Phase? The Perspective on Contrast Enhanced Ultrasound</td>
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<tr>
<td>3:31 PM</td>
<td>Korosh Khalili</td>
<td>Changes in Splenic Volume and Correlation with Platelet counts in Liver Donors</td>
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<td>3:39 PM</td>
<td>Martin E. O'Malley</td>
<td>Growth Rates of Hepatocellular Carcinoma</td>
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<td>3:47 PM</td>
<td>Stephanie Wilson</td>
<td>Maximum Intensity Projection Contrast-Enhanced Ultrasound Imaging of Liver Tumor Vascularity: Feasibility and Success</td>
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<td>3:55 PM</td>
<td>Tae Kyoung Kim</td>
<td>Evaluation of Hypervascular Liver Masses in Asymptomatic Young Low Risk Patients with Microbubble-Enhanced Ultrasound</td>
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<td>4:03 PM</td>
<td>Masoom A. Haider</td>
<td>Washout DCE vs T2 MRI prior to transrectal ultrasound biopsy in patients at high risk for prostate cancer</td>
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<td>4:11 PM</td>
<td>Arthur H. Zalev</td>
<td>Capsule Endoscopy Findings in Patients with Established and Suspected Small Bowel Crohn’s Disease: Correlation with Radiological and Endoscopic Findings</td>
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<td>4:19 PM</td>
<td>John O’Rourke</td>
<td>MRI: Physiologic and Morphologic Evaluation of Liver Disease in HHT</td>
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<td>4:27 PM</td>
<td>Kartik Jhaveri</td>
<td>CT Histogram Analysis in Characterizing Hyperdense Adrenal Nodules (&gt;10 HU on unenhanced CT) with Comparison to Chemical Shift MRI</td>
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<tr>
<td>4:35 PM</td>
<td>Patrick O’Keeffe</td>
<td>Retrospective comparison of triphasic liver CT and endoscopy in the detection and grading of esophageal varices in patient with cirrhotic liver disease</td>
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## Breast, Chest and Cardiac
Session Chair: Supriya Kulkarni

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<th>Time</th>
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<tr>
<td>4:45 PM</td>
<td>Bonnie Ohayon</td>
<td>MRI and Pregnancy Associated Breast Cancer</td>
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<tr>
<td>4:53 PM</td>
<td>Jim Li</td>
<td>Motion compensation in cardiac MRI imaging</td>
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<tr>
<td>5:01 PM</td>
<td>Heidi Roberts</td>
<td>Lung Cancer Screening using Low-Dose Computed Tomography in Toronto: First Experience</td>
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<td>5:09 PM</td>
<td>Narinder Paul</td>
<td>Quantitative Assessment of Nodule Detectability in Chest CT: Delving the Low-Dose Limits</td>
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<td>5:17 PM</td>
<td>Demetris Patsios</td>
<td>The Utility of Computer-Aided Detection (CAD) for lung cancer screening using low dose CT (LDCT)</td>
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<tr>
<td>5:25 PM</td>
<td>Tom C. Lee</td>
<td>Utilization and Outcomes of Ventilation/Perfusion Scans and CT Pulmonary Angiography for Emergency Investigation of Pulmonary Embolus from 2001-2003</td>
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<td>5:33 PM</td>
<td>Ryan Margau</td>
<td>Percutaneous Thoracic Drainages in Neonates: Drainage with Catheter Placement versus Treatment by Aspiration Alone</td>
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<tr>
<td>5:41 PM</td>
<td>Andre Pereira</td>
<td>Dynamic CT Perfusion for lung nodule characterization</td>
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<tr>
<td>5:49 PM</td>
<td>Colm Boylan</td>
<td>Fine Needle Biopsy of the Thyroid-Aspiration or Capillary Technique?</td>
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## Musculoskeletal, Physics and Ethics
Session Chair: Michael Wood

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<tr>
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<tr>
<td>5:59 PM</td>
<td>Gagan Ahuja</td>
<td>Investigation of magnification factor in digital radiography and validation of an automatic magnification calibration method for orthopedic surgical planning</td>
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<tr>
<td>6:07 PM</td>
<td>Lawrence White</td>
<td>Cartilage T2 assessment: differential of normal hyaline cartilage versus reparative tissue following arthroscopic cartilage repair</td>
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<tr>
<td>6:15 PM</td>
<td>Rola Shaheen</td>
<td>Significance of hip pain in children with sickle cell disease</td>
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<tr>
<td>6:23 PM</td>
<td>Marshall Sussmann</td>
<td>A New Method for Improving Resolution in MR Imaging</td>
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<tr>
<td>6:31 PM</td>
<td>Matthew McInnes</td>
<td>The Design and Implementation of a Formal Radiology Ethics Curriculum</td>
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</table>
6:39 PM  Meaghen Hyland  Correlation between Doppler ultrasonography and mesenteric angiography in patients with Hereditary Hemorrhagic Telangiectasia (HHT)

6:47 PM  Susan Armstrong  Bone Mineral Density and Fracture Risk in Adults with Cystic Fibrosis

6:55 PM  Walter Kucarczyk  Closing Comments
RESIDENT TRAINING PROGRAM

General Description

There were 50 residents in our program in the 2004-2005 year. The five-year program consists of one year of preliminary clinical training (PGY1), followed by four years of training in medical imaging.

The university-wide integration and rotational system ensures that each resident will have access to all the strengths of our large and expert faculty and the huge volume of clinical pathology. Residents have the opportunity to train at several large modern hospitals, doing so in groups of 5 – 10 trainees of all levels, thus maintaining a close working environment with peers and faculty. All hospitals are equipped with state-of-the-art equipment. Residents work daily with the best of general radiographic, ultrasound, CT and MRI technology. Several hospitals have digital image archiving and communication systems.

PGY1

PGY1 Clinical training is divided into two blocks, one eight-nine month block at core teaching hospitals and a two-three month block at a community hospital. During 2004 - 2005, the core teaching hospitals have been the Mount Sinai Hospital and the St. Michael’s Hospital. Community training is principally done at the North York General Hospital. The content of the PGY1 program included Medicine (General Medicine and Respiratory); Surgery (General Surgery, Orthopaedics, Urology, Neurosurgery, Obstetrics and Gynaecology); one month of Paediatrics; one month of Anatomy at the U of T Anatomy Department; and two months of elective choices. In the final month of PGY1, all residents come together for a Radiology Orientation Program, which introduces the trainees to physics, imaging equipment, clinical lectures, program issues and the core hospitals. The PGY1 rotation opportunities are reviewed annually, attempting to make the best of training choices in the clinical services.

PGY2

During 2004 - 2005, a PGY2 trainee spent the entire year at one or two of the three core teaching Departments (Mount Sinai – University Health Network, Sunnybrook and Women’s College Health Sciences Centre and St. Michael’s Hospital). There is a graduated increase in responsibility over the course of the year. In order to prepare residents to take night call (which starts in September), the year begins with a 10 week introductory program covering thoracic, GI, GU, CNS, MSK, CT and nuclear imaging. The remainder of the year consists of one or two month rotations in each of the above organ systems, as well as a one-month rotation in ultrasound.
PGY3

In 2004 - 2005, residents in this training year divided their rotations into three to six month blocks at hospitals different from that of their PGY2 training year. This allows the trainee an opportunity to see a different spectrum of pathology and to work with a different group of faculty. Rotations during the PGY3 year have included Breast Imaging, Neuroradiology, Ultrasound, Vascular-Interventional, and Nuclear Medicine as well as additional training in CT, MSK, GI and Chest. MRI training is included within all organ system rotations and is a strong component of all core hospitals.

PGY4

During this year, each resident spent a four-month block in Paediatric Radiology at the world famous Hospital for Sick Children. The other eight months is at one or two of the core hospitals. This year includes a two-month block of dedicated Angio-Interventional training. The resident also has four to six months of General Radiology rotations. The Armed Forces Institute of Pathology (AFIP) six-week rotation for Radiology-Pathology is scheduled during the General radiology time.

PGY5

The resident is usually allowed to use this year for electives, but this is conditional upon the resident having achieved an acceptable standard of competence in medical imaging. It may be spent concentrating on areas of relative weakness, or on subspecialty areas. Most residents include electives in obstetric ultrasound, cardiac imaging and Body MRI in this final year.

Armed Forces Institute of Pathology

All residents are encouraged to attend the Armed Forces Institute of Pathology in Washington, D.C., where they receive a six-week, intensive, didactic course in pathology correlated to imaging. This generally occurs during the PGY4 year. Some financial support is available. To date, we have been successful in reserving a sufficient number of positions at AFIP to permit all of our residents to attend at some point in their training.

Physics Instruction

All residents must be knowledgeable about the physics of medical imaging. To that end, intensive physics instruction is provided. One week courses are provided for the PGY1 and PGY3 years and there is also a five-day review course in the PGY3 or PGY4 year of training. These courses are organized by Martin Yaffe, Ph.D. (Department of Medical Imaging) and taught by the faculty of our department, the faculty of the Department of Medical Biophysics, and guest speakers.
Conferences

Residents are encouraged to attend imaging conferences, both to be involved in presenting papers or posters and also for the benefit of knowledge and interaction with the imaging community at large. During the PGY3 year, each resident is given the opportunity to attend a major imaging conference with the provision of financial support. The resident is not required to present at the conference to receive this support but does prepare a report following the meeting to highlight what they gained in their attendance. In addition, residents presenting papers or posters at recognized meetings generally receive financial support through affiliations with hospital imaging departments.

Seminars and Half-Day Program

Wednesday afternoons from September to June have been the focus for the academic program. There is a formal two to three hour weekly clinical seminar for PGY1, PGY2 and PGY3 residents. Most seminars are organized around organ systems and imaging modalities.

As well, there are special sessions for all resident years on non-clinical topics such as ethical and legal issues, practice management and career planning. Speakers from outside the Department add interest to the content of these featured sessions.

A 10 hour review series is provided for PGY5 residents each spring in preparation for the ABR and Royal College examinations.

Research

Residents in Medical Imaging are required to have a good foundation of research methodology and critical appraisal in order to either critically evaluate scientific medical literature or pursue independent research activities. Principles and issues of health technology assessment, quality improvement and clinical audits are also core components of the clinical research curriculum. Dr. David Mikulis is responsible for the design and delivery of the course curriculum, workshops, tutorials and lectures on these topics. Instruction in this curriculum is given throughout the Residency Program. In total, residents in Medical Imaging receive over 30 hours of course instruction.

Each resident is required to become involved in a research project beginning no later than the PGY3 year. All residents receive protected time to work on their project. The research is conducted in conjunction with one or more staff persons with a view to presenting the project during the PGY4 or PGY5 years at our Annual Research Day. The residents are encouraged to publish their results and to present them at national or international meetings.

Rounds

Teaching rounds, or small group conferences, are held at each of the core hospitals once or twice a day. University Division rounds are held for the entire department six to eight times annually at a central location.
View Box Teaching

Every resident in the PGY2 through to the PGY5 years receives daily teaching from faculty at the view box and in the procedure rooms. Teaching is based on the day’s cases, but may be supplemented with related cases from faculty teaching files. The amount of teaching varies from rotation to rotation but on average there are one to two hours of this type of one-to-one teaching daily. This program is widely recognized for the quality of teaching provided to residents. In addition, residents learn to teach others and are expected to teach students and observers in the Department.

Journal Club

This is organized by the residents and is held approximately five times annually.

Visiting Professor Program

This program of six lectures between October and April is organized by the CME Director of our department and is provided for all imaging specialists including community radiologists. Residents attend the lecture and reception. Visiting Professors from outside Toronto usually present resident teaching sessions at two or three of the teaching hospitals during their visits to Toronto.

Organ Imaging Review Course

This is a week-long, internationally recognized review course. It is given in September or October of each year. It is primarily intended as a CME course for practicing radiologists but also contains a wealth of valuable teaching material for residents. All residents are given some time off clinical services to attend, and can do so at no cost.

Program Evaluation

In addition to that carried out by the Radiologists-in-Chief and the teaching co-ordinators at each hospital, the residents complete an assessment of each rotation, and an annual assessment of the faculty’s teaching.

Program Supervision

This is the direct responsibility of the Program Director who is, in turn, responsible to the Departmental Chair and the Departmental Executive Committee. The Program Director is assisted by the Resident Training Committee, which is composed of a representative from each of the teaching hospitals, a PGY1 coordinator responsible for all PGY1 issues, as well as from Nuclear Medicine and the Research Committee. In addition, the University of Toronto Chief Resident in Medical Imaging and a resident representative from each year of training are full members of the committee.
There are Division Heads appointed for Cardiothoracic, Musculoskeletal, Abdominal, Pediatric, Vascular-Interventional, Breast Imaging and Neuroradiology. These Division Heads and the Program Director for Nuclear Medicine are responsible for rotation goals and objectives, suggested reading lists and recommendations regarding the resident lectures and seminars. Division Heads advise the Program Director and Resident Training Committee.

Resident Evaluations

- Evaluation consists of the following:
- An in-training evaluation completed following each rotation.
- A summary in-training evaluation at the end of each year of training.
- Results of the American College of Radiology multiple choice in-training examination, taken in the spring of each year.
- Results of a yearly oral examination based on the Royal College format (PGY2-5).
- Results of a written examination in physics following the PGY1 course.
- A practice OSCE examination in the spring of each year (PGY3-5).

Resident Awards

Outstanding residents are recognized by awards for clinical excellence, teaching and research.

1) Gordon Potts Award

This award of a commemorative plaque is made to the outstanding final-year resident, based on a combination of the following academic and personal strengths: Interpersonal skills, willingness to explore new methods and ideas, dedication to patient service and academic activities, intellectual capacity and publications in residency.

2004 - 2005 recipient: Dr. Vikash Prasad, PGY5

2) Resident Teacher-Mentor Award

This award will be made to a final year graduating resident, based on a combination of the following strengths and contributions: dedication to teaching, resident advocate and mentor, contribution to Resident Program and commitment to personal continuing educational growth.

2004 - 2005 winner: Dr. Sarah Koles, PGY5

3) Research Awards

Each year residents as well as fellows are nominated to receive the RSNA Research Award for Research excellence within the University Of Toronto Department Of Medical Imaging.
2004 – 2005 winner: Dr. Eric Bartlett, Neuroradiology Fellow

Summary

The University of Toronto training program in Medical Imaging is designed to provide the best possible training in all aspects of imaging. The program is an intensive one, with considerable emphasis on teaching, in addition to exposure to a huge volume of clinical pathology. The university-wide integration and rotational system ensures that each resident will have access to all of the strengths of our departments.
RESIDENTS

PGY1 Level

Alan Andrew, MD  
University of Toronto, 2004
Hemi Dua, MD  
University of Toronto, 2004
Dean Durant, MBBS  
University of the West Indies, 2001
Jonathan Mandel, MD  
University of Toronto, 2004
Aiden Mokhtassi, MD  
University of Toronto, 2004
Christopher Mongiardi, MD  
University of Ottawa, 2004
Elissa Price, MD  
University of Toronto, 2004
Lara Richmond, MD  
University of Toronto, 2004

PGY2 Level

Aditya Bharatha, MD  
University of Toronto, 2003
Minoo Bozorgzadeh, MD  
Iran Medical University, 1984
Philip Buckler, MD  
University of Toronto, 2003
Patrick Cervini, MD  
University of Toronto, 2003
Errol Colak, MD  
University of Toronto, 2003
Kebby King, MD  
University of West Indies, 1997
Robert Kurtz, MD  
University of Toronto, 1996
Jeff Mandelcorn, MD  
University of Toronto, 2003
Danny Mandell, MD  
McMaster University, 2003
Alex Menard, MD  
University of Ottawa, 2003
Jennifer Stemic, MD  
University of Toronto, 2003  
Jeremy White, MD  
University of British Columbia, 2003

**PGY3 Level**

Louis-Martin Boucher, MD  
University of Toronto, 2001  
Meg Chiavaras, MD  
University of Massachusetts, 2002  
Christopher Dyck, MD  
University of Toronto, 2002  
Lenny Grinblat, MD  
McMaster University, 2002  
Winnie Lee, MD  
University of Toronto, 2002  
Andrea Milic, MD  
University of Ottawa, 2002  
Shantel Minnis, MBBS  
University of West Indies, 1998  
Emma Robinson, MD  
University of Toronto, 2002  
Neil Rosta, MD  
Queen’s University, 1994  
Rola Shaheen, MD  
University of Jordan, 1996  
Brian Yeung, MD  
Queen’s University, 2002  
Katerine Zukotynski, MD  
University of Toronto, 2002

**PGY4 Level**

Gagan Ahuja, MD  
University of Toronto, 2001  
Harpreet Baweja, MD  
McMaster University, 1994  
Richard Bitar, MD  
University of Toronto, 2001  
Debra Chang, MD  
University of Toronto, 2000  
Deborah Cheng, MD  
University of Toronto, 2000
Meaghan Hyland, MD
    University of Ottawa, 2001
Jeffery Jaskolka, MD
    University of Western Ontario, 2001
Ryan Margau, MD
    University of Toronto, 2001
Elaine Martinovic, MD
    University of Calgary, 2001
Matthew McInnes, MD
    University of Toronto, 2001

PGY5 Level

Susan Armstrong, MD
    University of Toronto, 2000
Marc Freeman, MD
    University of Toronto, 2000
Aaron Glickman, MD
    University of Western Ontario, 2000
Anish Kirpalani, MD
    McMaster University, 2000
Sarah Koles, MD
    University of Calgary, 2000
Dan Mozeg, MD
    University of Toronto, 2000
Vikash Prasad, MD
    Dalhousie University, 2000
Michael Stefanos, MD
    University of Toronto, 2000
NUCLEAR MEDICINE TRAINING PROGRAM

General Description

Nuclear medicine is a branch of medical practice primarily concerned with the use of unsealed radioactive sources in the study, diagnosis, and treatment of disease. Our program currently provides dual-certification in radiology and nuclear medicine. This is a six year (including PGY1) program with two years of subspecialty training in nuclear medicine (provided that the subspecialty training is taken following the completion of at least 18 months in Diagnostic Radiology, effective June 1, 1998).

The Nuclear Medicine Program provides formal instruction and training for both radiology and nuclear medicine residents. Formal lectures cover various aspects of nuclear medicine including cardiac and oncologic nuclear medicine, functional neuroimaging, radiopharmacy, nuclear physics, and general nuclear medicine. Residents have specific goals, objectives and reading lists during their rotation at one of the teaching hospitals. There are biweekly teaching rounds for both radiology and nuclear medicine residents at these hospitals. The residents acquire skills by participating in daily clinical work. Didactic instruction is supplemented by teaching files at each hospital. Residents are encouraged to attend evening lectures given monthly or bi-monthly by internationally renowned guest speakers, who lecture on current topics in nuclear medicine at Toronto Nuclear Medicine Society Meetings. Journal clubs are occasionally organized where academic staff discuss interesting cases and/or current journal articles.

General Objectives

The goal of the nuclear medicine resident is to be able to function independently as a medical specialist with the ability to advise on, supervise, perform, and interpret all diagnostic procedures, and to achieve a level of competence in the performance of radiotherapy with unsealed radioactive sources so as to act as a consultant to referring physicians. The resident must acquire excellent communication and technical skills, and the knowledge and professionalism appropriate to a lifetime career in nuclear medicine.

Dual Radiology and Nuclear Medicine Residency

Applicants will be considered from candidates who are already in the Diagnostic Radiology Training Program at the University of Toronto, usually, one slot per year is reserved for the dual certification program.
RADIOLOGY SCIENTIST TRAINING PROGRAM

Objectives

The purpose of the Radiological Scientist Training Program (RSTP) is to provide a small group of radiology residents with the opportunity to develop skills important to the pursuit of independent research. These skills encompass research methodology, publications, grant writing, and presentations. The research training is intended to complement the excellent clinical training for which the Department of Medical Imaging is already recognized.

Organization

The RSTP is a six-year program with two years of research and four years of clinical training. The Royal College of Physicians and Surgeons of Canada will accept one year of research towards fulfilling the requirements of the five year program in diagnostic radiology. The RSTP is able to accommodate as many as two residents per year. The first two years of the RSTP are identical to the regular radiology training program. The difference is in the PGY3 and PGY4 years which, in the RSTP, are entirely devoted to research. Research opportunities are available in many departments relevant to radiology. Under certain circumstances, residents in the RSTP may pursue a M.Sc. or Ph.D. degree. The final two years, PGY5 and PGY6, are designated for clinical training to fulfill the requirements of the Royal College of Physicians and Surgeons of Canada.

Eligibility and Application Procedure

Applications will be considered from candidates already accepted into the regular radiology training program and will occur during the PGY2 training year. A maximum of two places per year will be reserved for residents in the RSTP. Applicants need not have prior experience in research or a special background, but are expected to be self-motivated.

Remuneration

Residents in the RSTP will be remunerated commensurate with residents in the regular radiology training program, up to a maximum of the PGY5 level.

Selection of Research Project and Supervisor

Residents in the RSTP should select a project and a supervisor as soon as possible, and before the PGY3 year. The Director of Research and the Chair of the department can offer assistance with this selection. A supervisor may be selected from various University of Toronto departments, including Medical Imaging, Medical Biophysics, Anatomy, Physiology, Biochemistry, Computer Science, Clinical Epidemiology, or Electrical Engineering, specifically the Institute of Biomedical Engineering. The supervisor must have operating funds to support the research, but is not expected to provide remuneration for the resident. Candidates will be strongly encouraged also to apply for a fellowship from an agency such as the Medical Research
Council, but acceptance into the RSTP will not be conditional upon success in obtaining such a fellowship.

**Graduate Degrees**

Residents in the RSTP are encouraged to pursue a graduate degree. The procedure depends somewhat on the department in which the research is to be conducted, but requires a separate application to that department and the School of Graduate Studies or Institute of Medical Sciences. Residents are responsible for fulfilling all requirements of the department in which they are registered as graduate students.

**Clinical Responsibilities**

During the two years of research training, residents in the RSTP will have minimal clinical responsibilities, probably limited to one on-call evening/night per week. In addition, residents in the RSTP are encouraged to maintain contact with clinical activities through attendance at select departmental rounds and teaching sessions. Such attendance will not be compulsory for RSTP residents in the two research years, as it is for residents in the regular training program.
OBJECTIVES OF TRAINING & SPECIALTY TRAINING
REQUIREMENTS IN DIAGNOSTIC RADIOLOGY

Definition

Diagnostic Radiology is a branch of medical practice concerned with the use of imaging techniques in the study, diagnosis and treatment of disease.

General Objectives

On completion of the educational program, the graduate physician will be competent to function as a consultant in Diagnostic Radiology. This requires the physician to have the ability to supervise, advise on and perform imaging procedures to such a level of competence, and across a broad range of medical practice, as to function as a consultant to referring family physicians and specialists.

Communication skills, knowledge, and technical skills are the three pillars on which a radiological career is built, and all are dependent on the acquisition of an attitude to the practice of medicine which recognizes both the need to establish a habit of continuous learning and a recognition of the importance of promoting a team approach to the provision of imaging services.

Residents must demonstrate the knowledge, skills and attitudes relating to gender, culture and ethnicity pertinent to Diagnostic Radiology. In addition, all residents must demonstrate an ability to incorporate gender, cultural and ethnic perspectives in research methodology, data presentation and analysis.

Specific Objectives

At the completion of training, residents will have achieved the following competencies so as to function effectively as:

i) Medical Expert/Clinical Decision-Maker

General Requirements

- Demonstrate diagnostic and therapeutic skills for ethical and effective patient care.
- Access and apply relevant information to clinical practice so as to have competence in clinical radiological skills.
- Demonstrate effective consultation services with respect to patient care, education and legal options.

Specific Requirements

- Understand the nature of formation of all types of radiological images, including physical and technical aspects, patient positioning, contrast media.
- Knowledge of the theoretical, practical and legal aspects of radiation protection, including other imaging techniques and their possible harmful effects.
• Knowledge of human anatomy at all ages, both conventional and multi-planar, with emphasis on radiological applications.
• Knowledge of all aspects of clinical radiology, including understanding of disease, appropriate application of imaging to patients, importance of informed consent, complications such as contrast media reactions, and factors affecting interpretation and differential diagnosis.
• Understand the fundamentals of quality assurance in radiology.
• Understand the fundamentals of epidemiology, biostatistics and decision analysis.
• Show competence in manual and procedural skills and in diagnostic and interpretive skills.
• Demonstrate the ability to manage the patient independently during a procedure, in close association with a specialist or other physician who has referred the patient. The radiologist should know when the patient’s best interests are served by discontinuing a procedure, or referring the patient to another physician.
• Understand the acceptable and expected results of investigations/and or interventional therapy as well as unacceptable and unexpected results. This must include knowledge of and ability to manage radiological complications effectively.
• Understand the appropriate follow-up care of patients who have received investigations and/or interventional therapy.
• Show understanding of a sound and systematic style of reporting.
• Competence in effective consultation, conduct of clinico-radiological conferences, and the ability to present scholarly material and lead case discussions.

ii) Communicator

• Establish appropriate therapeutic relationships with patients/families.
• Listen effectively.
• Obtain the appropriate information during consultation with referring physicians in order to be able to make recommendations regarding the most appropriate testing and/or management of patients.
• Discuss appropriate information with patients/families and the health care team, and be able to obtain informed consent for tests and procedures when this is needed.

Specific Requirements

• Have the ability to produce a radiological report which will describe the imaging findings, most likely differential diagnosis, and when indicated, recommend further testing and/or management.
• Understand the importance of communication with referring physicians, including an understanding of when the results of an investigation or procedure should be urgently communicated.
• Communicate effectively with patients and their families and have a compassionate interest in them.
• Recognize the physical and psychological needs of the patient and their families undergoing radiological investigations and/or treatment, including the needs of culture, race and gender.
iii) Collaborator

General Requirements
- Consult effectively with other physicians and health care professionals.
- Contribute effectively to other interdisciplinary team activities.

Specific Requirements
- Have the ability to function as a member of a multi-disciplinary health care team in the optimal practice of radiology.

iv) Manager

- Utilize resources effectively to balance patient care, learning needs, and other activities.
- Allocate finite health care resources wisely.
- Work effectively and efficiently in a health care organization.
- Utilize information technology to optimize patient care, life-long learning and other activities.

Specific Requirements
- Be competent in conducting or supervising quality assurance including an understanding of safety issues and economic considerations.
- Be competent in computer science as it pertains to the practice of radiology.

v) Health Advocate

General Requirements
- Identify the important determinants of health affecting patients.
- Contribute effectively to improve the health of patients and communities.
- Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements
- Understand and communicate the benefits and risks of radiological investigation and treatment including population screening.
- Recognize how radiological investigation or treatment would be detrimental to the health of a patient.
- Educate and advise on the use and misuse of radiological imaging.

vi) Scholar

General Requirements
- Develop, implement and monitor a personal continuing education strategy.
- Critically appraise sources of medical information.
- Facilitate learning of patients, house staff/students and other health professionals.
- Contribute to development of new knowledge.

Specific Requirements
- Competence in evaluation of the medical literature.
- The ability to be an effective teacher of radiology to medical students, residents, technologists and clinical colleagues.
- The ability to conduct a radiology research project, which may include quality assurance.
- Appreciation of the important role that basic and clinical research plays in the critical analysis of current scientific developments related to radiology.

vii) Professional

General Requirements
- Deliver highest quality care with integrity, honesty and compassion.
- Exhibit appropriate personal and interpersonal professional behaviours.
- Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements
- Be able to accurately assess one’s own performance, strengths and weaknesses.
- Understand the ethical and medical-legal requirements of radiologists.

Training in Canada

The foregoing represents the general and specific objectives that all candidates for the Royal College examinations in Diagnostic Radiology are expected to meet. For those training in Canadian programs, these objectives will be accomplished in a staged manner. Residents in Canadian programs may obtain the document describing this approach from their program directors.
SPECIALTY TRAINING REQUIREMENTS IN DIAGNOSTIC RADIOLOGY

These specialty training requirements apply to those who began training on or after 1 June 1997.

The five years of approved training require, at first, a closely supervised practice, with the opportunity for increasing responsibility in the final years, so that the resident near the end of training can function as a general radiology consultant, requesting help from staff radiologists when necessary. The residency may be followed by one or more years of fellowship training in a subspecialty discipline, as the residence training is not intended to provide a subspecialty level of expertise.

This period must include:

1) One year of basic clinical training:
The purpose of this year is to give the resident a degree of independent responsibility for clinical decisions; an opportunity for further development of the skills required in making effective relationships with patients; the consolidation of competence in primary clinical and technical skills across a broad range of medical practice; and an understanding of the nature of the relationship between a referring physician and a clinical radiological consultant.

2a) Three years of approved resident training in “general diagnostic imaging”, this must include:
Respiratory, cardiovascular, gastro-intestinal and biliary, genitourinary, musculoskeletal, mammography, neurological and pediatric radiology, as well as the following modalities: fluoroscopy, ultrasound, CT and MR imaging.
Because of the varying training programs in the recognized university training centres, these 36 months may be allocated as block periods of at least three months or their equivalents.

2b) One year of approved residency that may consist of one to twelve month periods in any of the following, as long as these are appropriately integrated by the Residency Training Committee:

- further training in diagnostic radiology
- diagnostic ultrasound
- CT
- MR
- nuclear medicine
- cardiac and/or vascular radiology
- interventional radiology
- neuroradiology
- pediatric radiology
• pathology or other clinical specialty relevant to the practice of radiology (for up to three months)
• a full-time research project, relevant to diagnostic imaging, and acceptable to the program director and the Credentials Committee.

NOTE: In view of the amount and variety of radiology to be covered and the skills required at the time of the final examination, it will seldom be appropriate to spend the entire 12 months of the fifth year in any one of these areas.
RESIDENT RESEARCH PROGRAM

While training in clinical radiology remains the main focus of the residency, research is considered to be of paramount importance as well. It is essential that residents gain experience in as many aspects of research as possible, including searching the literature, data analysis and manuscript preparation. A resident cannot know if he/she would enjoy an academic career without firsthand experience. The feeling of satisfaction that accompanies completion of a project, and contribution of information to the medical/scientific literature, can only be appreciated if personally experienced.

The Research Program consists of three aspects; a seminar series, resident support, and a formal presentation day.

Seminar Series

Residents in Medical Imaging are required to have a good foundation of research methodology and critical appraisal in order to either critically evaluate scientific medical literature or pursue independent research activities. Principles and issues of health technology assessment, quality improvement and clinical audits are also core components of the clinical research curriculum. Workshops, tutorials, and lectures on these topics are organized by the department’s staff who are responsible for the design and delivery of the course curriculum. Attendance at these sessions is compulsory and instruction of this curriculum is given throughout the Residency Program.

Support

Department faculty are asked to submit research topics from which residents may choose a project, which he or she finds interesting. The residents are given the opportunity to create their own topic or to choose one from this faculty-generated list. Residents are freed from clinical responsibilities for their work. Each resident presents a short, informal outline of the intended project to the Resident Research Committee in November of their PGY3 year so that project feasibility can be assessed before too much time has been devoted to it. Helpful suggestions are offered by Committee Members. Data collection for the project begins in January of the PGY3 year and extends to December of the same year. During June, the residents present an interim report, again informal, to the Committee, to confirm that data collection has begun and is progressing satisfactorily. In November/December the residents present a third informal discussion for assessment of project status and to determine if an abstract can be generated for submission to a national/international meeting. It is at this time that the Committee determines if the project is satisfactory. Incomplete studies may be considered satisfactory depending on the circumstances described by the resident. Finally, the study is presented formally in the following Spring at the Annual Research Day.
Presentation Day

Our 17th annual Department of Medical Imaging Research Day was held on April 21, 20045. The resident presentations included:

<table>
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<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Elaine Martinovic</td>
<td>Perfusion Abnormalities in “Benign” Developmental Venous Anomalies</td>
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<tr>
<td>Harpreet Baweja</td>
<td>Experience with the Jostent Peripheral Stent-Graft in Peripheral Vascular Injuries</td>
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<tr>
<td>Jeff Jaskolka</td>
<td>Pathologic analysis of radiofrequency ablation of pulmonary metastases in humans – preliminary experience</td>
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<tr>
<td>Richard Bitar</td>
<td>3D-High resolution Magnetic Resonance Direct Thrombus Imaging (hiresMRDTI) of atherosclerotic complicated plaque</td>
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<tr>
<td>Marc Freeman</td>
<td>Percutaneous Vertebroplasty Results in the Reversal of Height Loss and Spinal Deformity in Patients with Osteoporotic and Pathologic Compression Fractures</td>
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<tr>
<td>Tom C. Lee</td>
<td>Utilization and Outcomes of Ventilation/Perfusion Scans and CT Pulmonary Angiography for Emergency Investigation of Pulmonary Embolus from 2001-2003</td>
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<tr>
<td>Ryan Margau</td>
<td>Percutaneous Thoracic Drainages in Neonates: Drainage with Catheter Placement versus Treatment by Aspiration Alone</td>
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<tr>
<td>Gagan Ahuja</td>
<td>Investigation of magnification factor in digital radiography and validation of an automatic magnification calibration method for orthopedic surgical planning</td>
</tr>
<tr>
<td>Rola Shaheen</td>
<td>Significance of hip pain in children with sickle cell disease</td>
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<tr>
<td>Matthew McInnes</td>
<td>The Design and Implementation of a Formal Radiology Ethics Curriculum</td>
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<tr>
<td>Meaghen Hyland</td>
<td>Correlation between Doppler ultrasonography and mesenteric angiography in patients with Hereditary Hemorrhagic Telangiectasia (HHT)</td>
</tr>
<tr>
<td>Susan Armstrong</td>
<td>Bone Mineral Density and Fracture Risk in Adults with Cystic Fibrosis</td>
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While presentation at this meeting is an end unto itself, many of the projects have since been presented at national and international meetings and have been published in peer-reviewed journals. Since the research program was instituted, more than 60 of the resident’s projects have appeared in peer-reviewed journals. Of those not published, many have been presented either orally or as a poster at national/international meetings.
FELLOWSHIP PROGRAM

With access to several thousand inpatient beds, the affiliated hospitals of the University of Toronto form one of the largest teaching facilities in the world, thereby serving as an ideal setting for advanced subspecialty training in Medical Imaging. The program has national and international stature both clinically and in research, and attracts fellows from around the world.

In 2004-2005 the seven divisions of the University of Toronto Department of Medical Imaging offered a comprehensive array of fellowships:

- Abdominal Imaging
- Breast Imaging
- Cardiac Imaging
- Cross-sectional Imaging
- Magnetic Resonance Imaging
- Musculoskeletal Imaging
- Neuroradiology (Diagnostic)
- Neuroradiology (Interventional)
- Pediatric Imaging
- Thoracic Imaging
- Vascular/Interventional Radiology
- Women's Imaging
- Combined Clinical/Research

The flexibility of the program permits tailoring of the fellowship experience to accommodate most needs. Research is encouraged as an integral component of the fellowship program and to this end protected research time is available to all Medical Imaging fellows.

2004–2005 Department of Medical Imaging Fellows

Abdominal Imaging Fellows

- Alexander Coret
- Deirdre Doyle
- John Hanson
- Angela Ho
- Valerie Keough
- Selina Lem
- Andrew Lowe
- Jessica Murphy-Lavallee
- Patcirk O’Keeffe
- Anuradha Rao
- Sameh Tadros

Breast Imaging

- Pavel Crystal
**Cardiac Imaging Fellow**

- Andrew Crean

**Cross-sectional Imaging Fellows**

- Gillian Clarke
- Geoff Donsky
- Rupinder Kang
- John O’Rourke

**Magnetic Resonance Imaging Fellow**

- Richard Perng

**Musculoskeletal Imaging Fellows**

- Anita Chae
- Ali Naraghi
- Linda Probyn

**Neuroradiology (diagnostic) Fellows**

- Eria Bartlett
- Judith Corat-Simon
- Noel Fanning
- Tali Jonas-Kimchi
- Marlise Peruzzo dos Santos
- Ilan Shelef

**Neuroradiology (interventional) Fellows**

- Paula Klurfan

**Thoracic Imaging Fellows**

- Demetris Patsios
- Andre Pereira

**Vascular/Interventional Radiology Fellows**

- Peter Ballyk
- John Hanson
- John Kirby
- Vikramaditya Prabhudesai
- Daniele Wiseman

**Women's Imaging Fellow**

- Cara Betel
- Nicole Brofman
- Colm Boylan
- Zeinab Layton
- Bonnie O’Hayon
- Steven Singer
- Shalini Umranikar
Combined Clinical/Research Fellow

- Peter Ballyk

Pediatric Imaging Fellows

- Joao Amaral
- Ulrich Amendy
- Helen Branson
- Gulraiz Chaudry
- Stephen Fasulakis
- Lucia Fontalvo
- Flavia Gasparini
- Munire Gundogan
- Salwa Haidar
- Ganesh Krishnamurthy
- Eoghan Laffan
- Daniel Levine
- Erika Mann
- Sanjay Maroo
- Daniel Martin
- Clara Ortiz
- Rodrigo Ozelame
- Hemant Parmar
- Anke Raabe
- Ai-Min Sun
- Xingchang Wei
UNDERGRADUATE PROGRAM

Year I Medicine

The first year medical program consists of three main contiguous block courses of study. These include Structure and Function, Metabolism and Nutrition and Brain and Behavior. Medical imaging participates in the Structure and Function and Brain and Behavior courses.

Structure and Function

This course teaches anatomy, histology, and cardio-respiratory physiology.

Anatomy - Radiology Seminar

The anatomy radiology seminar series has been extensively revised and standardized. Seventeen lecturers gave a total of 48 hours of interactive seminars to the first year medical class using this new curriculum. The coordinator for this seminar series was Dr. Josee Sarrazin. These six seminars taught radiographic anatomy of the thorax, abdomen, pelvis-urinary tract, upper extremity, lower extremity and of the head and neck. Faculty lecturers participating in this seminar series included the following radiologists; Dr. Ray Chan, Dr. Tanya Chawla, Dr. Dr. Julien Chen, TaeBong Chung, Dr. Wayne Dietel, Dr. Tim Dowdell, Dr. Nasir Jaffer, Dr. Kartik Jhaveri, Dr. Seon Kyu Lee, Dr. Dorothy Lazinsky, Dr. Narinder Paul, Dr. Dawn Pearce, Dr. Joel Rubinstein, Dr. Josee Sarazin, Dr. Manu Schroff, Dr. William Weiser and Dr. Louis Wu.

Full Class Lecture - Medical Imaging Modalities

This one hour lecture was given by Dr. Nasir Jaffer. It outlines basic technical aspects of the major medical imaging modalities including X-ray, CT, MRI, ultrasound and nuclear medicine.

Brain and Behavior

From time to time, the Department of Medical Imaging has provided tutors for the Brain and Behavior course. Neuroradiology teaching tools have been developed by members of the department of Medical Imaging and are used in this course on an ongoing basis.

Year II Medicine

Year II teaching centers around the two main programs in the Year II curriculum: The Pathobiology of Disease (the first half of the year), and The Foundations of Medical Practice (the second half of the year).
The Pathobiology of Disease Course

This fourteen-week course teaches pathology, immunology, genetics and other similar subjects. The Department of Medical Imaging has worked on an ongoing basis to develop and provide the medical imaging teaching resources required for delivery of this PBL. (Problem based learning), oriented curriculum. The Medical Imaging coordinator for Pathobiology of Disease was Dr. Tanya Chawla.

Pathobiology of Disease - Imaging Case Material

In past years, a series of images with annotations was exhibited on a viewer in the Medical Science Building. The content of this series roughly paralleled and/or emphasizes the imaging aspects of the material taught in the Pathobiology of Disease course. Efforts are currently under way, in cooperation with course organizers, to revise and update these cases using current imaging technology. Increasingly, this case material will be presented to students in a web-based format.

Seminar in Chest Imaging

Dr. Narindar Paul and Dr. TaeBong Chung each gave a 2 hour seminar on chest imaging to half of the year 2 class, at the beginning of the Pathobiology of Disease Course. This seminar included a review of the radiographic anatomy and radiographic findings associated with the pathology of common diseases of the lung. Numerous radiographs of common lung diseases were presented.

Seminar in the Imaging of Cancer

This seminar emphasized the role medical imaging plays in the staging and follow-up of neoplastic disease. Dr. Martin O’Malley, Dr. Tanya Chawla and Dr. Kartik Jhaveri each gave this 2 hour seminar to members of the year 2 class.

Foundation of Medical Practice Course

This 21-week course teaches core clinical subjects such as medicine and surgery. Dr. TaeBong Chung was the Medical Imaging Coordinator for the Foundations of Medical Practice Course.

PBL Tutors

Faculty members in the Department of Medical Imaging participated as tutors by leading core multidisciplinary seminars in the Foundations of Medical Practice curriculum.

Dr. Frank Goldberg, Dr. Wayne Deitel and Dr. Danny Marcuzzi provided 102 hours of teaching time as tutors, plus an additional 55 hours of preparation for this course.
Year II Seminars

The chest imaging seminar, previously given through the academies was revised again last year. The seminar series was prepared and supervised by Dr. TaeBong Chung. This 2 hour seminar was given to smaller seminar groups of students at the academies by the following radiologists: Dr. Dae Chung, Dr. TaeBong Chung, Dr. Tim Dowdell, Dr. Nasir Jaffer, Dr. Myles Margolis, Dr. Narindar Paul and Dr. Harry Schulman participated in this seminar series.

Full Class Lecture in Trauma Radiology

A 2 hour, full class, lecture was given introducing key elements of trauma imaging. Topics covered included imaging of the cervical spine and brain, chest trauma and imaging of abdominal trauma. Participating radiologists in this lecture included Dr. William Weiser, Dr. Paul Hamilton and Dr. Richard Aviv.

Clerkship

The two-year clerkship consists of 78 weeks of clinical rotations. The department of medical imaging provides an array of teaching activity during the clerkship program.

Year III Clerkship

Essentials of Radiology Lecture Seminar Series

Dr. Manohar Schroff and Dr. Nasir Jaffer coordinated this lecture series. Five half day teaching sessions were presented to the year three class to help prepare them prior to the commencement of their clinical clerkship. This lecture/seminar series utilized a, one hour, full class lecture format followed immediately by a two hour, case review, seminar in which the class was divided into four groups.

The curriculum for this series brought together elements from the first and second undergraduate years in medical imaging instruction and emphasised core elements of medical imaging geared to the needs of clinical clerks. Full class lectures in this new program were delivered by the following radiologists in the following subject areas. Dr. Eran Hayeems – Interventional Radiology, Dr. TaeBong Chung – Chest Imaging, Dr. Tanya Chawla – Abdominal Imaging, Neuroradiology – Dr. Manohar Schroff, Muskuloskeletal Imaging – Dr. Robert Bleakney.
Seminars for this series were lead by the following radiologists.

**Interventional radiology** - Dr. Raymond Chan, Dr. Elizabeth David, Dr. Matthew Benjamin and Dr. E. Hayeems

**Chest Imaging** - Dr. TaeBong Chung, Dr. Kartik Jhaveri, Dr. Narindar Paul and Dr. Harry Schulman.

**Abdominal Imaging** - Dr. Tanya Chawla, Dr. Wayne Deitel, Dr. Nasir Jaffer and Dr. Myles Margolis.

**Neuroradiology** - Dr. Manohar Schroff, Dr. Tom Marotta, Dr. Walter Kucharczyk and Dr. Suzanne Laughlin.

**Muskuloskeletal Imaging** - Dr. Robert Bleakney, Dr. Joel Rubinstein, Dr. Matthew Lax and Dr. Tim Dowdell.

**Elective Students**

A significant number of third year medical students at the University of Toronto took electives in radiology at the various teaching hospitals during the 2004-2005 Academic year.

**Hospital Based Seminars**

Various Year III seminars have been held in the teaching hospitals as part of the Medicine - Surgery block rotations. These include a series of chest seminars, interventional, gastrointestinal, as well as neuroradiology seminars.

**Year IV**

**Medical Imaging Electives**

Electives in Medical Imaging are among the most popular medical under-graduate electives at the University of Toronto. In addition to teaching basic radiology skills these electives also serve to promote awareness about medical Imaging within the undergraduate medical community. Elective students are also given an opportunity to consider specialty training in radiology during these teaching blocks.

These electives remain very popular in the undergraduate elective program.

**University of Toronto Electives**

One hundred seven University of Toronto medical students took radiology electives in their third and fourth year at the various teaching hospitals during the 2004-2005 academic year.
Visiting Elective Students

Forty-nine medical students from outside medical schools, many of whom were overseas foreign students in their senior undergraduate year, took part in visiting electives during the 2004–2005 academic year.

The Bruce Tovee LMCC Review Lectures

The Undergraduate Committee in Radiology has participated in this review course for many years. Three hours of radiology review lectures were given to final year medical students. The majority of these were University of Toronto students. The review course has also been very well received and attended by final year students from McMaster and other local medical schools. The lectures were given in the evening at the main medical lecture theatre of the University. Three, one hour lectures were given. These are listed below.

i) Musculoskeletal Radiology – Dr. Robert Bleakney  
ii) Chest Radiology – Dr. TaeBong Chung  
iii) Gastrointestinal Radiology – Dr. Nasir Jaffer  
iv) Neuroradiology – Dr. Eugene Yu

The final year students have had access to a series of notes, the MCCQE Study Guide. The medical imaging portion of this lecture series and syllabus were updated and revised by the participating radiologists.

Other Teaching Activities and Involvement

Physiotherapy Student Seminars

A series of seminars are given to the physical therapy students at the University of Toronto by radiologists at the various Academies each year.

Career Sampling Electives in Radiology

On a somewhat informal basis, undergraduate students, many in Year I have spent various periods of time, from several days to weeks, in all of the teaching hospital radiology departments as part of a career sampling experience.

Undergraduate Teaching Computer File for Radiology

A comprehensive interactive computerized teaching program, called Radiofile has been developed by the Department of Medical Imaging. This program allows undergraduate students to have a uniform exposure to core medical imaging teaching material. The students can access this program either in the various radiology departments, or in the Academy computer laboratories. The program is available centrally, in the computer laboratory in the Medical Sciences Building.
The Internet and Undergraduate Education in Radiology

Under the direction of Dr. Nasir Jaffer, the Department of Medical Imaging hosts an internet web site on which various program descriptions are posted. This web site is also playing an expanding role in the Internet delivery of imaging seminars and programs as well as in the evaluation of undergraduate Medical Imaging teaching programs.

The Future Direction of the Medical Imaging Undergraduate Teaching Program

Medical Imaging is playing an expanding role in modern medical practice and as a result, there is an increasing demand for undergraduate teaching in this field. In response to this need, efforts have been under way to standardize the major components of the undergraduate medical imaging teaching program through the development and implementation of standardized curriculum and electronic teaching tools. This ongoing effort has and will continue to further optimize the efficiency, scope and value of the undergraduate teaching program in Medical Imaging at the University of Toronto.
CONTINUING EDUCATION PROGRAM

Organ Imaging Review
September 26 - 29, 2004

Course Description

This four day course focuses on aspects of primary interest to both radiologists and radiologists-in-training. The course content includes general concepts of diagnostic imaging with emphasis on recent advances. The participant learns new ideas and has the opportunity to enhance their knowledge in selected common clinical situations. The participant is also able to participate in problem-solving with daily case reviews in each of the organ systems.

Course Chairman: Walter Kucharczyk, M.D.
Course Director: Paul Hamilton, M.D.

University of Toronto Faculty

Atri, Mostafa, M.D., Associate Professor
Babyn, Paul, M.D., Associate Professor
Blaser, Susan, M.D., Associate Professor
Blakney, Robert, M.D., Associate Professor
Chawla, Tanya, M.D., Assistant Professor
Christakis, Monique, M.D., Assistant Professor
Chuang, Sylveser, M.D., Assistant Professor
Chung, Tae-Bong, M.D., Assistant Professor
Curpen, Belinda, M.D., Assistant Professor
Daneman, Alan, M.D., Professor
Dill-Macky, Marcus, M.D., Assistant Professor
Farb, Richard, M.D., Assistant Professor
Fox, Allan, M.D., Professor
Haider, Masoom, M.D., Assistant Professor
Hamilton, Paul, M.D., Assistant Professor
Hanbirdge, Anthony, M.D., Assistant Professor
Herman, Stephen, M.D., Associate Professor
Ibach, Deborah, M.D., Locum
Jong, Roberta, M.D., Associate Professor
Kim, Tae Kyoung, M.D., Associate Professor
Kulkarni, Supriya, M.D., Assistant Professor
Navarro Kunstmann, Oscar, M.D., Assistant Professor
Lax, Matthew, M.D., Assistant Professor
Macgowan, Christopher, PhD, Assistant Professor
Manson, David, M.D., Assistant Professor
Merchant, Naeem, M.D., Assistant Professor
Montanera, Walter, M.D., Associate Professor
Muradali, Derek, M.D., Assistant Professor
Noël de Tilly, Lyne, M.D., Assistant Professor
O’Hayon, Bonnie, M.D., Clinical Fellow
O’Malley, Martin, M.D., Assistant Professor
Oudjhane, Kamaldine, M.D., Associate Professor
Paul, Narinder, M.D., Assistant Professor
Pearce, Dawn, M.D., Lecturer
Provost, Yves, M.D., Lecturer
Ranson, Marilyn, M.D., Assistant Professor
Rubenstein, Joel, M.D., Associate Professor
Salonen, David, M.D., Assistant Professor
Shumak, Rene, M.D., Assistant Professor
Shroff, Manohar, M.D., Assistant Professor
Symons, Sean, M.D., Assistant Professor
TerBrugge, Karel, M.D., Professor
Traubici, Jeffrey, M.D., Assistant Professor
Weisbrod, Gordon, M.D., Professor
Weiser, William, M.D., Professor
White, Lawrence, M.D., Associate Professor
Willinsky, Robert, M.D., Professor
Wilson, Christine, M.D., Assistant Professor
Wilson, Stephanie, M.D., Professor
Wright, Barbara, M.D., Assistant Professor

Guest Faculty

Dachman, Abe, M.D.
Professor
Department of Radiology
University of Chicago
Chicago, Illinois
INVITED LECTURERS AND VISITING PROFESSORS

October 4-5, 2004 Dr. Nancy Wadden
Department of Radiology
Memorial University of Newfoundland

“Breast Pathology: A Radiologist’s Perspective”

“Breast Cancer Epidemiology/Breast Cancer Screening in Canada”

“Breast Ultrasound: sonographic Mamographic Correlation”

November 1-2, 2004 Dr. Myrosia Mitchell
Department of Radiology
University of Chicago

“Imaging of Morbid Obesity Surgery”

“The Adrenal Glands”

“Multimodality Imaging of Liver Lesions”

January 10-11, 2005 Dr. David Naidich
Department of Radiology
New York University Medical Center

“Diffuse Lung Nodules”

“Lung Nodule Evaluation”

“Pulmonary Thromboembolism”

February 7, 2005 Dr. Sylvester Chuang
Department of Diagnostic Radiology
Hospital for Sick Children

“MEG – Truth or Myth: How Useful is it?”

February 8, 2005 Dr. Charles Raybaud
Department of Diagnostic Radiology
Hospital for Sick Children

“Development and Malformations of the Corpus Callosum”
March 7-8, 2005  
Dr. J. Antonio Bouffard  
Department of Radiology  
Henry Ford Hospital  

“Ultrasonography of the Elbow”  
“Ultrasonography of the Lower Extremity”  
“Ultrasonography of the Adult Hip”

April 11-12, 2005  
Dr. Richard M. Gore  
Department of Radiology  
Evanston Northwestern Healthcare  

“The Enterocolitides: MDCT and DC Barium Features”  
“The Subperitoneal and Interfascial Planes: The Keys to Understanding the Intra-abdominal Spread of Disease”  
“Diffuse Liver Disease”

May 2-3, 2005  
Dr. Mark E. Schweitzer  
Department of Radiology  
New York University  

“MR Wrist: Internal Derangements”  
“Stress to Ligaments, Tendons, Muscle, Cartilage and Bone”  
“MR of the Elbow”