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## Department of Medical Imaging



**Craig Hacking**  
**Medical Director**  
**Medical Imaging**

The Department of Medical Imaging (DMI) provides a full range of diagnostic imaging and interventional services. DMI actively undertakes clinical research in departmental, interdepartmental and multi-site collaborative research projects. Under the directorship of Professor Alan Coulthard, the DMI Research Office supports many departmental research projects and clinical trials while further supporting external, service-based research studies established by other RBWH departments or external research groups. Our consultants, registrars, radiographers and nurses all provide expertise on imaging protocols, clinical diagnosis and interventional procedures to best support these projects. DMI has established strong research collaborations with local research institutes such as the Herston Biofabrication Institute, Queensland Brain Institute, the Centre for Advanced Imaging, QIMR Berghofer, HIRF, UQCCR and CSIRO. Over the coming years we hope to extend these research collaborations with international hospitals such as Mount Sinai Hospital in New York, as well as, collaborating with global industry partners.

### **Highlights of our research from 2020 include:**

First in Human Clinical Trials for medical devices used in interventional neuroradiology procedures such as endovascular clot retrieval.

EPPICS I Study: EPPICS (Enoxaparin for postoperative prophylaxis in coiling and stents) was a RANZCR-supported randomised controlled trial in patients having elective endovascular aneurysm treatment. It compared standard-of-care post-procedure unfractionated heparin (UFH) infusion with either subcutaneous enoxaparin 1mg/kg (at T=0 and T=12 hours) or enoxaparin 1.5mg/kg (at T=0), with the primary outcome of attaining therapeutic anticoagulation. The outcomes from this study led to the research team being successfully awarded another grant to further this investigation with EPPICS II.

CONSULT Study: The aim of this project was to clinically validate custom-made tractography software. Images created by the software will assist radiologists and neurosurgeons in their pre-surgical planning of patients about to receive brain surgery. This work is currently being assessed by the TGA to validate it for clinical use.

PICC Study: This radiographer-driven study is designed to determine the optimal vein size-to-catheter ratio to reduce the occurrence of thromboembolic events in patients with PICC lines. This project has expanded from a single-site project to a multi-site study involving TPCH and Redcliffe Hospitals.

The Medical Imaging Department has been fortunate to secure the opportunity to install four Spectral CT Scanners across the Herston Precinct. The Herston Precinct will be the only site globally to contain this number of Spectral CT Scanners thereby providing endless opportunities to perform cutting edge imaging research. Collaborations with various universities and research institutes currently investing in artificial intelligence and deep-machine learning algorithms that integrate with imaging platforms are already being developed. In turn, this will give our imaging staff exposure to leading technology in diagnostic imaging.

Despite COVID, 2020 has been a dynamic time for research within the Medical Imaging Department. Our research has provided valuable insights into the standards of practice within the department by exploring new diagnostic and interventional avenues. The diverse range of clinical trials currently being conducted within DMI will lead to changes of practice which will directly affect patient treatment and care across all imaging modalities.

## Research Awards and Achievements

Recipient (RBWH staff in bold)	Award	Event
<b>Tahleesa Cuda</b>	2020 National Branch of Origin Research Prize	2020 RANZCR National Branch of Origin

## Current RBWH [Department / Research Group Led](#) Research Activity

Lead Investigator Name (RBWH staff in bold)	Other Study Investigators (RBWH staff in bold)	Research Project Title	Number of Patients Recruited in 2020	Total number of Patients Recruited
<b>Nicole Waters, Maria Sathi, Matt Fielder, Jeff Hocking, Marita Prior, Rebecca Liong, Alan Coulthard</b>	Dept. Medical Imaging	Bright Spots Study – Prospective study of clinically silent ischaemic events post elective endovascular treatment of intracranial aneurysms	0	60 (completed)
<b>Matt Fielder, Jeff Hocking, Marita Prior, Alan Coulthard</b>	<b>Rosalind Jeffree</b> (Neurosurgery), <b>Thomas Robertson</b> (Anatomical Pathology), <b>David Reutens</b> (Neurology, Centre for Advanced Imaging)	High field magnetic resonance imaging of hippocampal sclerosis	4	8
<b>Jeff Hocking, Rebecca Liong, Maria Sathi, Matt Fielder, Peter Jenvey, Marita Prior, Alan Coulthard</b>	Dept. Medical Imaging	Enoxaparin for postoperative prophylaxis in intracranial coiling and stents (EPPICS I)	35	150 (completed)
<b>Matt Fielder, Maria Sathi, Rebecca Liong, Jennifer Gillespie</b>	<b>Ryan Sommerville</b> (ENT) HIRF Centre for Advanced Imaging (CAI)	Perineural Spread of Head and Neck Cancers	2	14
<b>Jennifer Gillespie, Matt Fielder</b>	<b>Ryan Sommerville</b> (ENT)	Utility of Black Blood MRI Sequence in Evaluating Perineural Spread in Head and Neck Cancers	N/A	N/A
<b>Matt Fielder, Alan Coulthard</b>	<b>Nanda Surendran</b> (Neurosurgery)	Common Vertebral Artery Variants and their Clinical Implications	N/A	N/A
<b>Marita Prior, Alan Coulthard, Thulasi Rajah</b>	<b>Rosalind Jeffree</b> (Neurosurgery), Lee Reid (CSIRO)	CONSULT – Predicting Surgery-induced Neurological Deficits using CONSULT	5	11
<b>Macy Lu, Peter Jenvey, Marita Prior</b>	<b>Jerry van de Pol, John Kinyanjui, Lucas Daniele</b> (Orthopaedics) HIRF	Prospective assessment of graft incorporation and ligamentisation after anterior cruciate ligament (ACL) reconstruction using two different hamstring tendon fixation techniques		
<b>Tahnee Mason, Nikki Newman, Marita Prior</b>	Dept. Medical Imaging	PICC Study – What is the optimal vein size-to-catheter ratio to reduce the occurrence of thromboembolic events in patients with PICC lines?	70	504
<b>Akshay Rao, Sonja Gustafson, Macy Lu, F Sitheequ, Marita Prior</b>	Dept. Medical Imaging	MR Enterography - Impact on image quality using split dose Buscopan	0	20 (completed)
<b>Stephanie Plunkett</b>	Dept. Medical Imaging	Education and maternal anxiety in fetal magnetic resonance imaging	45	45 (completed)

Lead Investigator Name (RBWH staff in bold)	Other Study Investigators (RBWH staff in bold)	Research Project Title	Number of Patients Recruited in 2020	Total number of Patients Recruited
<b>Brianna Hochkopper</b>	Dept. Medical Imaging	Computed Tomography Pulmonary Angiography: Potential Reduction in contrast volume and rate of injection with spectral reconstruction	N/A	N/A
<b>Sidney O'Conner</b>	Dept Medical Imaging	Evaluation of the Sensitivity and Specificity of Computer Aided Diagnosis in Detecting Known Cancers in Mammographic Examinations	N/A	N/A
<b>Katherine Smith</b>	Dept. Medical Imaging University of Sydney	The one scan dual-energy CT urogram solution	N/A	N/A
<b>Georgia Quigley</b>	<b>Mark Appleyard</b> (Gastroenterology) <b>Jack Svenson</b> (Medical Physicist)	The impact of patient body habitus and patient positioning on occupational eye exposure from endoscopic retrograde cholangiopancreatography (ERCP) procedures	N/A	N/A
<b>Rachael Anstey</b>	<b>John Younger</b> (Cardiology) <b>Karen Dobeli</b> (DMI)	Comparison of Left Ventricular Structure and Function Analysis by Cardiac Magnetic Resonance	N/A	N/A

### Collaborative Research Activity Involving RBWH Department / Research Group

Lead Investigator Name (RBWH staff in bold)	Other Study Investigators (RBWH staff in bold)	Research Project Title	Number of Patients Recruited in 2020	Total number of Patients Recruited
Mark Midwinter (UQ)	<b>Marita Prior</b>	CT KUB and Trauma	N/A	N/A
Patrick Brennan (University of Sydney)	<b>Karen Dobeli, Marita Prior</b>	Advancing lung cancer detection in developed and developing countries	N/A	N/A
Mark Allenby (QUT)	<b>John Clouston, James Harvey, Marita Prior</b>	An Intelligent Risk Stratification Software to Predict Intracranial Aneurysm Rupture	N/A	N/A
Reade de Leacy (Mount Sinai Hospital)	<b>Ken Mitchell, John Clouston, Alan Coulthard, Kate Mahady, Marita Prior</b>	PADUANO registry	N/A	N/A
Amanda Ullman (Griffith University)	<b>Elizabeth Wignall, Alan Coulthard</b>	PICNIC Trial		
Joanne George (UQ)	<b>Jane Bursle</b>	PREBO-6 Trial	N/A	N/A
<b>David Clark</b> (Colorectal Surgery)	<b>Karen Dobeli, Marita Prior</b>	A Phase 2 study of efficacy: The validation of Gastrografin measurement in postsurgical samples following low anterior resection where the rectal tube is flushed with Gastrografin	N/A	N/A

## Research Publications

### Journal Articles

1. Sreedharan S., Churilov L., Chan J., Todaro M., **Coulthard A., Hocking J., Mahady K. et al.** Association between CYP2C9 polymorphisms and ischemic stroke following cervical endovascular neurointervention. *J Stroke and Cerebrovascular Disease*. 2020
2. Bukhari W., Clarke L., **Coulthard A., et al.** The clinical profile of NMOSD in Australia and New Zealand. *J Neurol*. 2020
3. Khalilidehkordi E., Clarke L., **Coulthard A., et al.** Relapse patterns in NMOSD: Evidence for earlier occurrence of optic neuritis and possible seasonal variation. *Frontiers in Neurology*. 2020
4. Liang E., **Mahady K., Coulthard A.,** Winter C. Treatment of a middle cerebral artery aneurysm in the setting of LDS: Case Report and review of literature. *Radiology Case Reports*. 2020
5. Simpson-Yap S., Oddy W., Ausimmune Investigators Group (**Coulthard A**) *et al.* High prudent diet factor score predicts lower relapse hazard in early multiple sclerosis. *Multiple Sclerosis Journal*. 2020
6. Black L., Zhao Y., Ausimmune Investigators Group (**Coulthard A**) *et al.* Higher fish consumption and lower risk of central nervous system demyelination. *European Journal of Clinical Nutrition*. 2020
7. **Gillespie J.**, Imaging of the post-treatment neck. *Clinical Radiology*. 2020
8. Williamson F., Coulthard L., **Hacking C.,** Martin-Dines P. Identifying risk factors for suboptimal pelvic binder placement in major trauma. *Injury*. 2020
9. Reid L., Martinez-Heras E., Manjon J., Jeffree RL., Alexander H., Trinder J., Solana E., Lufriu S., Rose S., **Prior M.,** Fripp J. Fully automated delineation of the optic radiation for surgical planning using clinically accessible sequences. *BMJ*. 2020
10. Allenby M., Liang E., **Harvey J.,** Woodruff M., **Prior M.,** Winter C., Alonso-Caneiro D. Detection of clustered anomalies in single-voxel morphometry as a rapid automated method for identifying intracranial aneurysms. *BioRxiv* 2020
11. Bhandari A., Ibrahim M., Sharma C., **Liong R., Gustafson S., Prior M.** CT-based radiomics for differentiating renal tumours: a systematic review. *Abdominal Radiology* 2020
12. Bhandari A., **Liong R.,** Koppen J., Murthy SV., Lasocki A. Noninvasive Determination of IDH and 1p19q status of lower-grade gliomas using MRI radiomics: A systematic review. *Am J Neuroradiol*. 2021. (Epub 2020)
13. **Zhao H., Steinke K.** Long-term outcome following microwave ablation of early-stage non-small cell lung cancer. *JMIRO*, 2020
14. **Steinke K.** The debate for thermal ablation of colorectal cancer pulmonary metastases is heating up. *Quant Imaging Med Surg*, 2020
15. **Tani D., Ladwa R., Xu W., Lwin Z., Steinke K., Hughes B.** Outcomes of incidental pulmonary nodules in head and neck squamous cell cancer patients treated with curative intent. *J Head and Neck Physicians and Surgeons* 2020
16. **Scott A., McDonald A., Roberts T., Martin C., Manns T., Webster M., et al.** Cardiovascular Telemedicine Program in Rural Australia. *N Engl J Med* 2020

## Conference Presentations – Invited Speaker, Oral and Poster

### Invited Speaker

1. **Hacking C.** Trauma in pregnancy. *Radiopaedia* 2020 (virtual)
2. **Hacking C.** Emergency imaging of stroke. *Everlight Everlearning Webinar Series* 2020 (virtual)
3. **Gillespie J.** Imaging of the post-treatment neck. *European Society of Head and Neck Radiology Webinar Series* 2020 (virtual)
4. **Gillespie J.** Imaging approaches for patients with headache. *Neuroscience Conference, Doha Qatar*, 2020

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5. **Gillespie J.** Role of imaging in trigeminal neuralgia. Neuroscience Conference, Doha Qatar, 2020

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  6. **Gillespie J.** Head and Neck Spaces. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  7. **Gillespie J.** Managing misses: Head and Neck. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  8. **Gillespie J.** Facial Nerve Reanimation. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  9. **Roberts J.** Early GBM. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  10. **Coulthard A.** Efficacy of Single Dose Enoxaparin Post Elective Neurointervention in prevention of thromboembolic events. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  11. **Clouston J.** Value-based healthcare: the next way of providing care? ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  12. **Mahady K.** Managing misses: Neuro. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  13. **Mahady K.** INR: Spinal vascular intervention. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  14. **Splatt A.** Spinal Anatomy. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  15. **Odenthal C.** Cranial Nerves 9-12. ANZ Society of Neuroradiology ASM, Brisbane, 2020

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  16. **Anstey R.** Comparison of left ventricular structure and function analysis by cardiac magnetic resonance using automatic interpretation of compressed sensing images vs standard imaging with manual processing. Herston Health Precinct Symposium, 2020
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## Poster Presentations

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1. **Purchuri SN., Steinke K.** Pictorial essay of radiological features of early lung cancers associated with cystic airspaces. RANZCR ASM, 2020

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  2. **Cossens M.** Improved quality of thyroid ultrasound reports following the implementation of the ACR Thyroid Imaging Reporting and Data System Nodule Lexicon. ARRS ASM, 2020

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  3. **Anstey R.** Evaluation of left ventricular systolic function assessment by cardiac magnetic resonance using automatic interpretation algorithm and compressed sensing imaging compared to manually performed assessment using standard steady-state free precession imaging. Cardiac Society Australia and New Zealand ASM, 2020

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  4. **Anstey R.** Evaluation of left ventricular systolic function assessment by standard steady-state free precession cardiac magnetic resonance using automatic left ventricular ejection fraction assessment software compared to manually performed assessment. Cardiac Society Australia and New Zealand ASM, 2020

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  5. **Liong R., Coulthard A.** Enoxaparin for Postoperative Prophylaxis in Intracranial Coiling and Stents (EPPICS) RANZCR ASM 2020

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  6. **Liong R., Coulthard A.** Antiplatelet therapy in Interventional Neuroradiology. RANZCR ASM 2020

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  7. **Loh B., Liong R., Malacova E., Bain R.** Inferior vena cava filter indications, complications and patient follow-up: the 7-year experience with 402 patients at an Australian tertiary centre following establishment of an Interventional Radiology database. RANZCR ASM 2020

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  8. Bhandari A, **Liong R**, Koppen J, Murthy SV, Lasocki A. Artificial Intelligence for the MRI Prediction of Molecular Subtype in Lower-Grade Gliomas. RANZCR ASM 2020

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  9. Bhandari A, Nguyen K, **Prior M.** Convolutional Neural Networks: A Guide for Radiologists. RANZCR ASM. 2020
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