heart TO HEART

THE BAIRD INSTITUTE
Applied heart & lung surgical research

NOVEMBER 2017

Welcome

Welcome back to our revamped "Heart to Heart" newsletter. Heart to Heart will be published twice a year with the aim being to keep you updated on all that is happening in research and training at The Baird Institute.

2017 has been a big year! In May, we released our first biennial report, *The Baird Report*. If you didn't receive a copy and would like one, please contact us and we will happily mail it to you. You will also find it on our website. Dr Michael Seco, the recipient of The Baird Institute's Edwards Lifesciences scholarship, completed his PhD and you can read more about this below. We have seen the continuation of the robotics program and the establishment of The Surgical and Robotics Training Institute, the first of its kind in the Southern Hemisphere, of which Professor Bannon is the director. A landmark study, led by Professor Michael Vallely involving 37,720 patients, demonstrated that a newer "no-touch" beating heart bypass surgery technique (anOPCABG) reduced postoperative stroke by 78% compared to traditional coronary artery bypass grafting (CABG). The results were published in the February edition of the Journal of the American College of Cardiology (JACC), considered to be the pre-eminent Cardiology journal in the world. Finally, our surgeons have been involved in the publication of over 50 academic journal articles this year; you will find a research update with an outline of some of our more important publications later in this newsletter.

To all our donors – thank you - the work of The Baird Institute is only possible due to you and we appreciate and value your continuing trust and support. On behalf of the team at The Baird Institute, I would like to extend to you and all your families, best wishes for the holiday season and for a very healthy and happy 2018.

Catherine

Catherine Rush
Engagement Manger, The Baird Institute

DOCTORAL WORK *by Michael Seco*

Michael Seco, the recipient of The Baird Institute's Edwards Lifesciences scholarship, completed his PhD this year. The main results from his research are presented below.

My thesis examined a number of new minimally-invasive surgical techniques, and whether they improved results for patients. The first was transcatheter aortic valve implantation, which involves replacing a heart valve using a wire inserted in the groin, much like a coronary stent. It produced excellent results in patients where conventional open-heart surgery would be very high risk. The second was a method of performing coronary artery bypass grafting without stopping the heart and using a heart-lung machine. This is called 'off-pump' bypass. We found that it reduced the risk of stroke, which is a serious complication of bypass surgery. Lastly, we looked at robotic-assisted heart surgery, where traditional operations are performed through 'key-hole' incisions using advanced instruments. These operations achieved excellent results, were safe, and resulted in faster recovery and return to normal activities.

CLINICAL TRIALS

It has been a busy and exciting year for the Cardiothoracic Clinical Trials Department at Royal Prince Alfred Hospital (RPAH) which is supported by **The Baird Institute**. Along with the surgeons in RPAH, the clinical trial coordinators, Lisa Turner and Lorna Beattie, are responsible for running the 9 cardiothoracic clinical trials and registries within the hospital. One of the current trials we are involved in is the VISION Study, a large international study looking at vascular events in patients having cardiac surgery. It is our biggest trial running at present and Lisa and Lorna have successfully recruited 433 patients to date with recruitment continuing for at least another year.

The TRiCS III trial, which compares 2 different blood transfusion strategies in patients having cardiac surgery, finished recruitment earlier in the year and is now in the follow-up phase. 19 patients were recruited at RPAH which is a great contribution to the international study.

The recently completed ATACAS Trial was awarded, 'Clinical Trial of the Year, 2017' by the Australian Clinical Trials Alliance. This was very exciting news as 107 patients were recruited to this trial at RPAH. The trial found that taking aspirin before having open heart surgery does not result in a higher bleeding risk, but instead protects against heart attack and stroke. It also found that tranexamic acid (a medication to reduce bleeding after cardiac surgery) does not increase clots after open heart surgery.

COMMUNITY FUNDRAISERS

The Baird Institute has a wonderful bunch of committed people who support us in our endeavours to raise money for life saving, heart and lung research. One such person is Natalie Zugec who lost her husband, James, to an aortic aneurysm in 2013. James was just 35 years of age when he passed away. Their children, Zara and Jaxon, were aged 3 years and 5 months at that time. Natalie works tirelessly to increase awareness of heart related diseases and has raised close to $100,000 over the past 4 years. Most recently, she got together a team to participate in the City to Surf and raised $3,000.

If you have a community fundraising idea, we would love to hear from you. Email catherine@bairdinstitute.org.au or call 02 9550 2350

Connected Care

Heart and Lung Nurses' Conference

10 March 2018

In March 2018, **The Baird Institute** will again host the Heart & Lung Nurses' Conference in conjunction with our surgeons, nurses and researchers working at Royal Prince Alfred Hospital, Strathfield Hospital, Macquarie University Hospital and The University of Sydney. Nurses representing each hospital are helping to develop a dynamic conference program that will support and expand the knowledge and care delivery of specialist nurses working in the perioperative, critical care and cardiac ward specialties. Speakers from the fields of surgery, nursing and research will highlight advances in biomedical research, new ways to care for patients with changes to surgical practice, robotics and artificial intelligence / virtual reality, mechanical oxygen delivery and practical workshops on anatomy, image interpretation and a Q&A session. The Conference will be at RPA's Kerry Packer Education Centre on 10 March 2018 and is open to all interested in the field of heart and lung surgery. For more details, email Maureen: research@bairdinstitute.org.au

A BEQUEST *Vale Mr Michael Ryan*

We recently received a sum of money from the estate of Mr Michael Patrick Ryan. Mr Ryan left a gift to **The Baird Institute** in his Will; we would like to acknowledge this and send a special thank you to Mr Ryan's family – what a wonderful legacy he has left!

A gift left to **The Baird Institute** in a Will enables us to continue to foster, fund and promote cardiothoracic research in medical undergraduates, graduates and our own surgeons. This in turn will lead to greater public health benefits for the whole community and in addition will help to secure the future for people living with heart and lung disease

If you would like information on leaving **a gift in your Will**, or a confidential discussion, please contact Catherine Rush, our Engagement Manager, who will be pleased to answer any questions you may have. Please call on 02 9550 2350

Rodney Merrett

1st Person in NSW to Undergo Open Heart Surgery

Recently we had a visit from Mr Rodney Merrett. Rod was the 1st person in NSW and one of the 1st in Australia to undergo open-heart surgery using the 'new' American Heart-Lung Machine; he was only 9 years of age and is still going strong today – 60 years later! The surgery took place at Royal Prince Alfred Hospital in November 1957 with a number of surgeons present; Professor Rowan Nicks, Head of the cardiac surgery department at RPAH, Dr Frank Mills and Dr Henry Bahnson and Dr Frank Spencer from the Johns Hopkins Hospital in the USA.

Below are some memories from Rod's time at RPA.

I was sedated on the day, but I do remember being taken via a tunnel under Missenden Road to the Page Chest Pavilion (which is on the site where the Chris O'Brien Lifehouse now sits) where the operation was to take place. All the nurses met me at the lift, wished me all the best and kissed me good-bye. The next thing I remember is being in a room with a strange looking machine nearby – I was told it was a heart-lung machine. After this time, I remember nothing until about a week later when I came to, with leads and tubes all over me. One large tube was coming out of my groin; and when I asked for a drink, a small amount of orange juice was fed to me and then urine was removed from my bladder using a huge syringe - very strange indeed!! Being only 9 years of age, I don't remember much at all, but I do recollect being quite bored at times, I did manage to occupy my-self however. There were 8 other children who had open-heart surgery around the same time. We would get up to all sorts of shenanigans like hiding from the nurses when injection time was due and taking a walk outside the hospital. One time while still at RPA, I was flush with money – I had been given sixpence – so I decided to go spend it. I left the hospital, walked along a stone fence, down to the main road and wandered along until I found a shop where I was able to buy some chewing gum. When I finally made it back, the entire hospital was looking for me as I had been missing for some time. They were not happy. After 6 weeks in hospital I returned home.

The group of 9 children who had open-heart surgery in 1957 at RPAH with one of the US surgeons, Dr Henry Bahnson. Rod is in the front row on the far left

RESEARCH REPORT: THE YEAR IN REVIEW

Research at The Baird Institute continues to make a difference to every patient our surgeons treat; based upon clinical and laboratory research in collaboration with our key researchers. Over the last year we have seen seven key areas of focus come together to help surgeons and researchers use technology and skilful surgery to improve patient survival and quality of life. Surviving cardiac disease, genetic issues and blood vessel problems in heart and lung patients has been directly improved by your donations. Here are updates on major research and highlights of recent research publications, demonstrating how your donations have helped patients.

Professor Paul Bannon MB BS, FRACS, PhD
Chair, The Baird Institute

AORTIC WORK

- Dr Liu from the **Centenary Institute** with her **Baird Institute** colleagues published in Circulatory Research, 2017: *'ARHGAP18 protects against thoracic aortic aneurysms formation by mitigating the synthetic and proinflammatory smooth muscle phenotype'.* This leading paper looks at the gene responsible for building our blood vessels. Understanding how genes influence aortic aneurysm development will help identify a cure for this devastating blood vessel anomaly.
- Dr Sherrah, a recipient of **The Baird Institute** *Medtronic Research Scholarship*, published a pivotal paper in the Journal of American Cardiology 2016: *'Nonsyndromic thoracic aortic aneurysm and dissection outcomes with Marfan Syndrome versus bicuspid aortic valve aneurysm'.* This exacting review identified the significant differences in disease processes that affect the Aorta and require surgery. Surgeons and researchers globally have used this analysis to examine their own results to ensure better patient outcomes.
- Surgeon and Professor Paul Bannon (chair of **The Baird Institute**), and fellow board member and cardiologist, Richmond Jeremy are working with Professor Grieve (a scientist and Radiologist) at **the Charles Perkins Centre** to investigate blood flow in the abnormal ascending thoracic aorta, with the assistance of a **National Health and Medical Research Council (NHMRC)** grant. This research blends with studies made possible due to the establishment of an Aortic Tissue Bank and Database at **Royal Prince Alfred Hospital**; allowing research into cardiac disease processes and surgical care.

CORONARY ARTERY WORK

- In our work with patients who suffer heart disease from atherosclerosis (hardening of the arteries and the formation of fatty plaques) and heart attacks (a myocardial infarction), our surgeons and researchers are currently investigating the long-term benefits of performing beating-heart surgery, instead of the traditional approach where the heart was stopped and complications from stroke could occur; especially in patients with known risk factors for stroke. Professor Michael Vallely and colleagues published a landmark study of their experience using a 'no-touch' technique (anOPCAB) based upon their experience with 37,720 patients that showed a reduction in stroke of 78% compared to traditional bypass surgery, reduced mortality (50%), less kidney failure (53%), 48% less bleeding problems and a reduction in ICU length of stay. The website has an ABC produced video clip of Professor Vallely operating on a patient using this technique. See: Journal of the American College of Cardiologists, *2017 'Coronary artery bypass grafting with and without manipulation of the ascending aorta'*.
- **The Baird Institute** is working with researchers at the **Charles Perkins Centre** to better understand operative challenges for heart and lung surgery and are using the **Hybrid Operating Theatre** to simulate these challenges. Dr Hugh Paterson recently published a study within this area in Journal of Thoracic Cardiovascular Surgery 2017: '*Competitive flow in coronary bypass surgery: The roles of fractional flow reserve and arterial graft configuration'*.
- Clinical Trials, supported by **The Baird Institute**, at RPAH are contributing to findings nationally and globally to ensure that improved techniques and technology will help patient survival. One such trial is the VISION study, conducted with the **George Institute** and **Abbott Diagnostics** to investigate blood levels of Troponin, a protein, that might signal early heart muscle damage in surgery.
- Exciting new research continues in the field of developing synthetic materials that mimic blood vessels. Dr Wise and colleagues published in Nanomedicine, 2017 *'Plasma activated coating immobilizes apolipoprotein A-I to stainless steel surfaces in its bioactive form and enhances biocompatibility'*. Recent results from their work in establishing artificial blood vessels indicates that these blood vessels act like normal blood vessels and reduce the risk of clotting. This approach will help surgeons use 'fake' blood vessels when the patient's own vessels are too damaged for use.

ECMO AND HEART FAILURE WORK

- Outside-the-body blood oxygenation (known as ECMO) in the treatment of heart failure, continues to be an area of research that provides important practice changes to help patients recover better from major heart and lung surgery. This machine was used extensively in non-surgical patients during the 2009 infamous swine flu pandemic Dr Michael Stevens from the **Charles Perkins Centre** is working with **The Baird Institute** and recently published in the Journal of Biomechanics, 2017: *'Flow mixing during peripheral veno-arterial extra corporeal membrane oxygenation - A simulation study'*. Michael's work involves studying how blood is returned from the ECMO machine and mixes with the patient's residual blood. These effects cannot be seen with current imaging in theatre, so Michael has been using computer simulation of these effects in a wide-range of patient-specific conditions and scenarios, to provide feedback to the surgeon and the wider research community on these effects.
- In contrast to this approach, a systematic review undertaken by Dr Michael Seco and **The Baird Institute** researchers has analysed a large series of published papers on the use of Left ventricular Assist Devices (LVADs) that help the heart function until a heart transplant is performed. Published in the International Journal of Cardiology, 2017: *'Long-term prognosis and cost-effectiveness of left ventricular assist device as bridge to transplantation: A systematic review'*, the overall analysis of data from these papers provides certainty that the use of LVADs continues to provide reliable care and continuing improved outcomes for patients beyond the initial surgical period.
- Continuing work is being done with Professor John Fraser and the **National Health and Medical Research Council** of Australia in the ACTIONS (Advanced Cardio-respiratory Therapies Improving OrgaN Support) study, conducted with the **Centre for Research Excellence**.

HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY (HOCM) WORK

- Our Baird Institute affiliate researcher, Dr Passage, in collaboration with Fred Mohr's group in the internationally recognised **Leipzig Heart Centre (Germany)**, recently published on a new surgical approach to repair the Mitral valve in patients suffering from an enlarged heart muscle (particularly the left ventricle). The journal paper features a video, demonstrating the innovative surgical approach that improves patient outcomes after the surgery: Annals of Cardiothoracic Surgery, 2016: *'Transmitral myectomy and how to deal with systolic anterior motion (SAM) in hypertrophic obstructive cardiomyopathy'*. These researchers are renowned for their work and a continued collaboration will contribute to an incredibly important learning relationship.
- Other work within the area of HOCM is looking at genetic factors contributing to valve and ventricular disease and the establishment of a Heart Muscle Tissue Bank to further research and interventions into cardiomyopathy.

VALVE WORK

- Along with research into aortic surgery, valve research explores the surgical repair, non-invasive repair or replacement of valves within the heart. Valves help hold and push blood through the four ventricles of the heart and into/out of the lungs. Professors Wilson and Vallely, along with Professor Ng from the **Heart Research Institute**, have a continuing commitment to research into valve disease, with a focus being the elderly patient and transcatheter aortic valve implantation (TAVI). The area of research has some crossover with aortic root reconstruction surgery and approaches to these types of surgery involves understanding patient risk factors, types of surgery best suited to that patient and perfecting surgical skills.
- Repair or replacement of the mitral valve has changed so much over the years and research continues to inform best practice. A new approach for patients too unwell to have surgery, is the endovascular (through the blood vessel) placement of a clip to reduce valve leakage. Results from 'Mitraclip' surgery are constantly being reviewed over the long term to improve patient survival and longevity. This is further supported through animal model research and surgical training conducted in the **Charles Perkins Centre** laboratories.

LUNG CANCER WORK

- Dr Michael Seco and Dr Matheus Carelli are currently developing a comprehensive lung and thoracic surgery database at **Royal Prince Alfred Hospital**. This will involve the collection of data on patients undergoing lung cancer resections and other major chest operations. Databases for these patients provide valuable information about surgical practices, patient recovery and outcome, and quality control. The cardiac surgery database at **Royal Prince Alfred Hospital** has been in use for over a decade and continues to serve multiple analyses and publications each year, and it is hoped the thoracic database will have a similar impact. This work will also form the basis of a comparable nation-wide database.

EMERGING RESEARCH

- An imaging analysis known as Neural Connectivity, is being undertaken by Professor Grieve and colleagues, to explore imaging processes to better understand brain injury after cardiac surgery. New imaging technologies using MRI are now able to identify subtle brain injury not seen using other imaging technology. This is exciting, ground breaking work, recently published in British Journal of Anaesthesia, 2017: *'Neural network imaging to characterize brain injury in cardiac procedures: the emerging utility of connectomics'*.
- In addition to this form of imaging, the use of computational modelling and augmented reality for surgical planning and teaching is now becoming part of tertiary-level practice. 3-D printing and bio-printing are proving to be important to research as is the understanding and production of biomaterials, currently being explored with our affiliate researcher, Dr Steve Wise.
- Robotic training and its uses are being researched through the **Institute of Academic Surgery** and the **Surgical Robotic Program**. The use of artificial intelligence and nano-robotics makes this an exciting field to explore for their practical and research-based uses in heart and lung surgery.

Many Thanks to Our Supporters

Every one of our donors has contributed in a significant way to our research and training programs and we are very grateful for their support, however we would particularly like to thank our principal supporters.

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Season's greetings

Season's greetings from all the surgeons, staff and researchers at The Baird Institute. We wish you all the very best for the holiday season.

For a full list of all research publications of **The Baird Institute**, please go to our website **www.bairdinstitute.org.au/our-publications/**

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