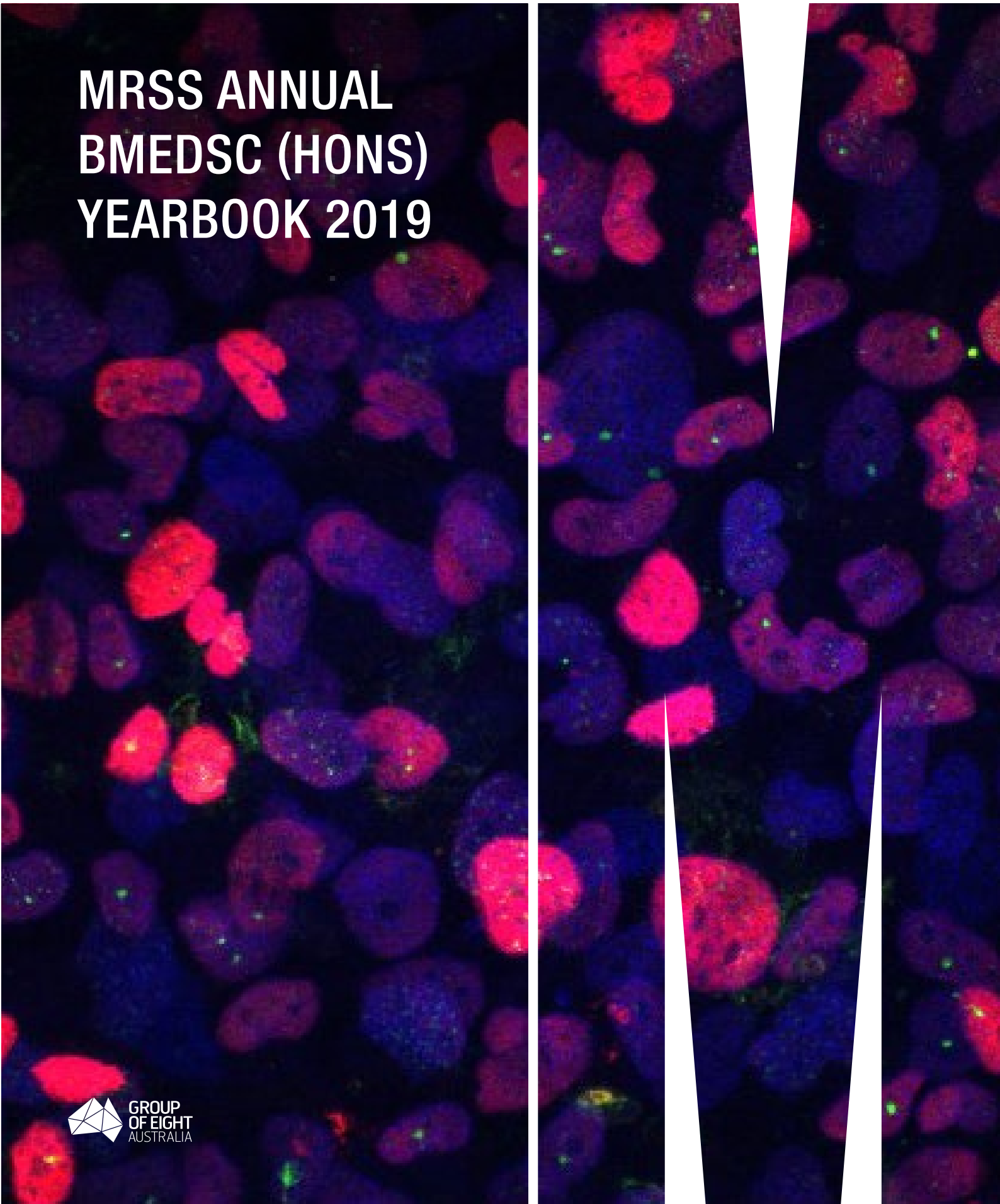
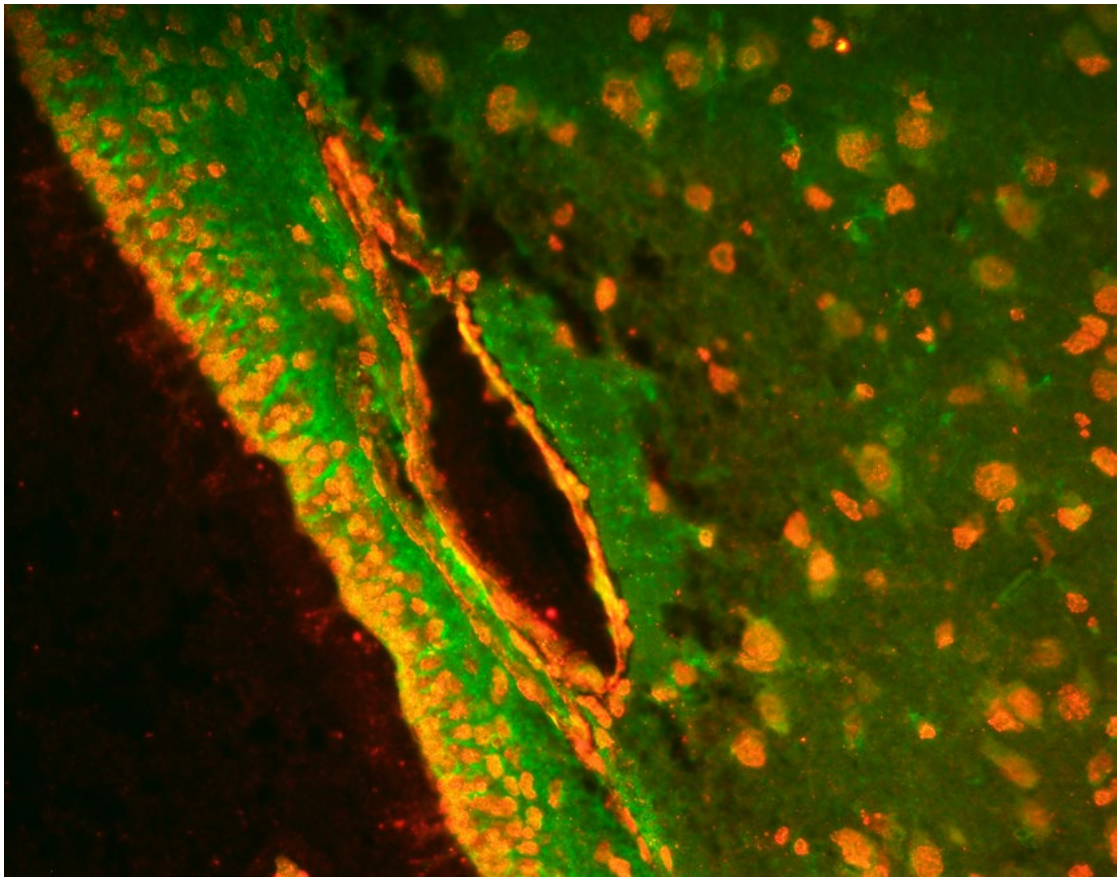
MONASH University

MONASH
MEDICINE
NURSING AND
HEALTH SCIENCES

MRSS ANNUAL BMEDSC (HONS) YEARBOOK 2019



GROUP OF EIGHT AUSTRALIA



FRONT COVER

Stevano Wijoyo – Medical Science to Art – Colour Me Pink (with antibody)

Immunofluorescence staining of T98G human glioblastoma cells labelled using a variety of antibodies. Green hues detect Gamma-H2AX that indicates DNA damage. Blue hues detect DAPI which stains viable cells. Pink hues indicate methyl groups in histone 3 lys4 (H3K4me2). H3K4me2 is actively demethylated by LSD1; when this occurs gene transcription is halted. Therefore, the stronger the pink hues, the lower LSD1 activity is, and transcriptional repression is less likely to occur.

INSIDE FRONT COVER

Alex Bell – Lamb subventricular zone blood vessel stained using desmin/α SMA double-label immunofluorescence

We stained sections the brains of growth restricted and appropriately grown fetal lambs at different gestational ages using desmin and smooth muscle actin double label immunofluorescence. We used the amount of overlap in the vascular wall between the red and green fluorescence markers to determine the extent of pericyte coverage of the vasculature, and how this changed across late gestation in FGR.

BACK COVER

Amy Chew – The Heart

This is a CT coronary angiogram of a human heart with the major coronary arteries highlighted in red and the myocardium ghosted in white. In our project, we investigated a novel, non-invasive CT-derived index which has been proposed as a possible measure of microvascular function. Currently, the only way to measure microvascular function is invasively during left heart catheterisation. To get this index, we had to isolate the coronary arteries (as pictured) as well as the left ventricular myocardial mass.

Message from the BMedSc(Hons) Convenor and Course Management Committee

Dear BMedSc(Hons) Students, congratulations on completing your BMedSc(Hons) degree! Well done, it is a very significant achievement.

The Course Management Committee and I would like to thank you for choosing to embark upon a formal year of research in BMedSc(Hons). We hope that the Honours year has given an appreciation of: how new knowledge is created, how medical research is translated into changes in clinical practice, how important evidence-based medicine is for ensuring that changes to practice are justified, and an appreciation of how much more there still is to learn about medical practice and how our bodies function in health and disease! We also hope that the BMedSc(Hons) year has challenged you both personally and academically. By the end of the year most students will feel like they have undergone an exponential learning curve, not just in their research area, but also in their confidence to critically evaluate new research findings, to communicate in written and oral formats and in their ability to work independently, as well as a member of a team. We hope that your Honours year has equipped you with all of these skills and many more.

We would also like to express our thanks to your supervisors and to the very large number of unsung heroes who have devoted their time to help you learn during the year. The Course would not be possible without them. We are also very grateful to the large number of examiners who willingly volunteer their time every year to assess Literature Reviews, Theses, Departmental Oral Seminars and the Faculty Oral and Poster Presentations. Thank you also to the MRSS committee, particularly your BMedSc(Hons) Student Representative Ashan Kathriachchige. Ashan has worked hard to organize information sessions and to feedback your questions and comments, helping to improve your own experience as well as that of future cohorts. On behalf of the BMedSc(Hons) Course Management Committee, we wish you all the very best for a bright future.

A/Professor Megan Wallace,
Director of Medical Student Research,
Faculty of Medicine, Nursing and Health Sciences

Message from MRSS

Congratulations on completing the BMedSc(Hons) course for 2019! It has a been a long year of ups and downs, but we finally made it through. For many of us we were thrown into the deep end at the beginning of the year, not knowing a thing about research, but without realising it I'm sure you all found your feet. I can say with certainty that we have all grown in someway this year, whether it be professionally or personally. By finishing the year, you have demonstrated that you have the ability to work hard, thrive in unfamiliar environments and overcome difficult tasks. Even if it was only a tiny step, you have made a contribution to science and you are well on the way to contributing more throughout your career. All of this makes you a better doctor, and I'm excited to be working along side you all with the knowledge that you come with this new experience. I'm proud of all that you have achieved throughout the year and it was an honour serving as your student representative. – Ashan Kathriachchige, BMedSc(Hons) student representative.

Ashan Kathriachchige, BMedSc(Hons) Representative

Joshua Ahn

INVESTIGATION OF A NOVEL PLATELET MECHANO-TRANSDUCTION RESPONSE TO EXTENSIONAL STRAIN AT STENOSIS

Supervisor Names and Institute Affiliations:
Dr. Warwick Nesbitt
Professor Harshal Nandurkar

I undertook my project at the Australian Centre for Blood disease with a lab team specialising in microfluidics in haematology. I chose to do a BMedSc(Hons) to pursue something different and I wanted to see the possibilities beyond clinical medicine. I chose this particular project as it was quite novel, and unique in its engineering component. It was a difficult and intense year, particularly adapting to such a basic science-based project, but through the experience I've gained unique skills and experiences that will help me in the long term.
I believe I've gained a new insight into the world of research and have enjoyed working long term as part of a team, with people from different backgrounds each offering different perspectives.
Feel free to contact me about my project, or my experiences in a laboratory as a medical student.

ABSTRACT

Background

Current antiplatelet therapies target various receptors and agonists but are commonly limited by the bleeding risk they generate. However, mechanical forces also play a major role in pathological activation of platelets. The most widely studied mechanical force in circulation shear, particularly peak shear, and mainly with regards to the mechanically activated protein von Willebrand factor. There is new evidence that platelets may be activated purely by mechanical forces, independent of soluble agonist or adhesion receptors. I investigate the effect of extensional strain, one of the candidate mechanical forces responsible for platelet activation, on calcium signalling in platelets.

Method

I assessed the effect of extensional strain on platelet activation by measuring intracellular platelet calcium as a function of platelet function. We carefully washed and treated platelets to remove soluble agonists and other factors that may activate platelets before reconstituting it with washed red blood cells before flowing it through micro-contractions and observed its effect via a fluorescence-based assay to calculate calcium concentrations. We were able to isolate the effect of extensional strain from other mechanical forces by using specially designed and fabricated hyperbolic channels in polydimethylsiloxane (PDMS) microfluidic device. I used a new calcium dye Cal-520®-AM to more accurately measure calcium changes in the platelets.

Results

Experiments using straight contractions seem to suggest that there is a mechanical force driving platelet activation at regions of acceleration and deceleration independent of peak shear. However, the extensional strain generated by our hyperbolic contractions did not result in increased platelet signalling. In all the stenosis I investigated, the calcium signalling remained same, or did not show a significant increase, compared to the straight segment control (L300 Wc40 C6666, p=0.5218; L225 Wc51.6 C6666, p=0.9294; L150 Wc72.7 C6666, p=0.9917; L225 Wc40 C5000, p=0.9165; L150 Wc40 C3333, p=0.4257).

Conclusions

The extensional strain generated by the hyperbolic stenosis I investigated did not result in increased platelet signalling. This leads to two main conclusions – firstly that our stenosis did not exert enough force to trigger platelet activation, or that extensional strain is not a major independent mechanical force leading to platelet activation. It may be that there is yet another un-investigated mechanical force driving platelet activation at stenosis.

Mayu Balachandran

Albumin Infusion and AKI Following Cardiac Surgery – Randomised Trial (ALBICS)

Prof Yahya Shehabi
Department of Critical Care and Perioperative Medicine, Monash Health
School of Clinical Sciences, Faculty of Medicine, Nursing and Health Sciences, Monash University
Prof Julian Smith
Department of Cardiothoracic Surgery, Monash Health
School of Clinical Sciences, Faculty of Medicine, Nursing and Health Sciences, Monash University

Hey guys! I did a BMedSc(Hons) in 2019 and I absolutely loved it. I learnt so much in such a short time. I improved my skills as a presenter. I worked with technologies that weren't even on the market yet.
I became a mini expert in my field. For the first time I was able to educate (and debate with) consultants and registrars on topics that were actually meaningful.
Doing research lets you work with a degree of autonomy that the rest of medical school just doesn't give you. In fourth year, I was excited at the mere prospect of seeing patients on my own. In my BMedSc(Hons) I was coordinating a multi-centre clinical trial across five hospitals and two states, and instructing medical teams on how the study treatments should be carried out.
Research presents a way to pursue creativity in a way that clinical medicine doesn't allow. It lets you use your own ideas to innovate new solutions to exciting problems. You have the potential to change medical practice all over the world. In summary, doing a BMedSc(Hons) is great. If you're sitting on the fence, give it a whirl and maybe you'll see it my way too.

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ABSTRACT

Background

Acute kidney injury (AKI) affects approximately 30% of patients after cardiac surgery. It is associated with increased mortality, long-term morbidity, and significant economic burden. Albumin is a fluid used commonly used in the ICU. Often used only as a volume expander, albumin also has many pharmacological properties that may protect the kidneys after surgery.

Method

An open-label multicentre randomised controlled trial was designed. We recruited adult patients undergoing cardiac surgery who were undergoing a complex cardiac procedure or had baseline renal insufficiency. Patients were stratified according to baseline renal function (<60ml/min or ≥60ml/min) and randomised to receive either an infusion of concentrated albumin or standard care in the ICU after surgery. The planned sample size is 590 patients. Albumin was infused over the first 16 hours from randomisation at 20ml/hour. Patients were followed up until discharge from hospital. The primary outcome was the incidence of AKI during hospital stay as defined by KDIGO criteria. Secondary outcomes were AKI stage II and III, mortality, length of stay in hospital/ICU, and ventilation requirements. Tertiary outcomes included early fluid balance and various biochemical parameters. A subgroup analysis of the effect of baseline renal function on outcomes was performed.

Results

This study is far from completion. Nine patients were included for analysis. Five were randomised to receive albumin while four received standard care. There was no significant difference in the incidence of AKI, mortality, duration of hospital/ICU stay or ventilation requirements. Relative risk of AKI was 0.53 (CI: 0.16-1.80, p=0.524). Serum albumin levels at 24 hours were significantly higher in patients who received albumin (32g/l vs 25g/l, p=0.016). The subgroup analysis did not yield any statistical difference between treatment groups for any study outcome. Relative risk of AKI did not differ based upon pre-existing renal insufficiency.

Conclusions

This is the first large RCT investigating albumin in this population. The analysis was underpowered to detect differences between treatment groups. However, this study is feasible, and should continue until study completion.

Piyusha Banneheke

The PRACS Trial: Perioperative Pregabalin for the Prevention of Chronic Pain after Cardiac Surgery

Supervisor: Professor Yahya Shehabi
School of Clinical Sciences, Faculty of Medicine, Nursing and Health Sciences, Monash University
Department of Anaesthesia, Monash Health
Department of Intensive Care, Monash Health
Co-supervisor: Dr Martin Kim
Department of Anaesthesia, Monash Health

Hi, I'm Piyusha. I undertook my BMedSc(Hons) this year at Monash Medical Centre with the Department of Anaesthesia and the Department of Intensive Care. Going into this year I wanted to explore the worlds of medical research and critical care, as well as having a well-deserved change of pace following year 4C. For my project, I had to design, build and run a double-blinded randomised control trial from the ground up. As challenging as it was, I found it infinitely rewarding, exciting and eye-opening. This year has taught me so much about the groundwork that occurs behind the scenes of medical research and put me in a position where I would feel comfortable creating and conducting a trial from scratch. I was incredibly fortunate to be guided by my two excellent supervisors, Yahya and Martin, but I couldn't have gotten far without the tireless support of the entire ICU research team. We still have a long way to go with recruitment, so if you are keen to be involved, want another publication out of your time in research, or just have questions, don't hesitate to get in touch:

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ABSTRACT

Background

Even though multimodal analgesia is the preferred mode of delivering pain relief after surgery, neuropathic agents are often not used. There is some evidence showing that early intervention with neuropathic agents can lead to reduced chronic pain at 3 months post-op following open cardiac surgery. A large component of chronic pain is considered to be neuropathic in origin, stemming from damage to neurons peripherally and from central sensitisation. This can lead to hyperalgesia and allodynia in some patients resulting in long lasting pain that is often resistant to regular analgesic treatment. Pregabalin is an anticonvulsant medication most commonly used for the treatment of neuropathic pain associated with sciatica, shingles and fibromyalgia. It's properties of reducing stimulation in pain nerves could contribute to improved chronic pain results at 3 months following a highly invasive surgery such as open cardiac surgery. We will endeavour to give pregabalin in the peri-operative period where pain signalling would be most intense to "numb" these nerves and reduce central sensitisation.

Method

We are performing a double-blinded, placebo controlled randomised control trial at Monash Health and Austin Health with a population of 200 patients randomised equally into two arms. The first arm will receive perioperative dosages of pregabalin while the control arm will receive matching doses of placebo. The patients will receive an initial dose 2 hours prior to surgery of 150mg (2 capsules) pregabalin. Then 75mg (1 capsule) will be given at 12, 24, 36 and 48 hours after surgery. Recordings of pain, opioid usage and other factors will be performed in the acute period of the first 48 hours after surgery, and in the chronic period at 1, 3 and 6 months after surgery. These chronic pain interviews will be performed by telephone interview using the Brief Pain Inventory (BPI).

Results

At this point in time, we have only recently started recruitment. Of the 200 patients required for this study we have only recruited 9. Furthermore, because the results for these patients are double-blinded, even early analysis could not be performed without unblinding and thereby compromising the integrity of the study. A description of the statistical analysis plans to be conducted once results are available is discussed.

Conclusions

We hope to show that in adult patients receiving open cardiac surgery, perioperative treatment with pregabalin is a feasible and effective way to reduce the incidence of chronic pain at 3 months and 6 months, as well as reducing opioid usage within the first 48 hours. We also hope to demonstrate the safety of using pregabalin in this patient population immediately before and after surgery.

Alexander Bell

Late Gestational Adaptations of the Neurovascular Unit to Fetal Growth Restriction

Supervisor Names and Institute Affiliations:
Atul Malhotra[1,2,3], Margie Castillo-Melendez[2,4],
[1]Department of Paediatrics, Monash University
[2]The Ritchie Centre, Hudson Institute of Medical Research
[3]Monash Newborn, Monash Children's Hospital
[4]Department of Obstetrics and Gynaecology, Monash University

This year offered me an ideal opportunity to get the exposure to research in a laboratory environment that I had always wanted. Being keenly interested in fetal and neonatal health, a project looking at neurovascular development in FGR seemed a perfect fit for me. Having now completed the project, I'm incredibly grateful for having pursued the opportunity. This year has been unbelievably enjoyable. Not only have I been able to learn new techniques and ways of thinking, I have had the privilege of sharing every day with an amazing group of people. I was excited but also somewhat apprehensive going into the year, but I leave with valuable skills and friendships that will stay with me for many years to come.

ABSTRACT

Background

Fetal growth restriction (FGR) a relatively prevalent complication of pregnancy associated with placental insufficiency leading to chronic hypoxia, and predisposing to a range of fetal and postnatal morbidities. Among associated consequences of FGR are a variety of effects on the brain, including outcomes linked to the cerebrovasculature. In recent times, associations have been made between the effects of FGR on the brain and possible alterations at the level of the neurovascular unit (NVU). The NVU is a collection of cellular and extracellular structures, operating together as a single functioning unit to influence functions such as barrier permeability and local blood flow at the level of the cerebral microvasculature. The developing NVU has shown a particular susceptibility to acute hypoxic insults, however responses to chronic hypoxia remain unclear. Recent evidence has suggested chronic hypoxic insults, such as FGR, may cause fundamental alterations in the developing NVU, and that these alterations may be linked to associated clinical outcomes.

Aims

Our investigation aimed to investigate the responses of fetal NVU components to FGR across several timepoints in late gestation, and to identify alterations within the NVU by comparing FGR brains at these timepoints to appropriately grown controls at each gestation using an established sheep model.

Method

Single umbilical artery ligation surgery was performed on fetal sheep at 105-days gestation (term = ~145-days), inducing placental insufficiency and leading to FGR. Lambs were delivered and euthanised at gestational ages of 115-, 125- and 145-days, and brain tissue collected immediately. Brain tissue from FGR lambs and appropriately-grown controls at each gestation was stained using immunohistochemistry (IHC) to investigate vascular remodelling (MMP-9 IHC), endothelial proliferation (Ki67 IHC), blood-brain barrier maturity (GLUT1 IHC), blood vessel morphology and density (laminin IHC), and capillary structural stability, determined by pericyte coverage (desmin/α-SMA immunofluorescence). Staining was analysed in the regions of the corpus callosum (CC), cortical gray matter (Cx), periventricular while matter (PVWM), subcortical white matter (sCWM), and subventricular zone (SVZ).

Results

FGR brains displayed substantial variation across several regions in levels of GLUT1 and MMP-9 expression across late gestation. Appropriate for gestational age (AGA) lambs showed significant variation in vessel sizes in several brain regions, which peaked at 125-days gestation. Vessel sizes were also substantially increased in AGA at 125-days, compared with FGR lambs, while FGR lambs displayed significantly increased GLUT1 expression at this gestational age. FGR brains also displayed a significant reduction in SVZ vascular pericyte coverage at 115-days, and vascular MMP-9 expression at 145-days.

Conclusions

The developing NVU displays substantial alterations in FGR lambs, when compared both across late gestation and with AGA controls. These alterations can be seen in several NVU components across multiple domains, and are likely to represent an adaptive response to a chronic hypoxic environment. The observed structural changes seen at the NVU in FGR may be associated with various clinical outcomes, including white matter pathologies and cerebrovascular dysfunction. Our findings and the potential contributions that understanding the developing NVU can make to protective strategies for these outcomes make this an area worthy of ongoing investigation.

Lucinda Blackshaw

Barriers and facilitators to the implementation of evidence-based lifestyle management in polycystic ovary syndrome: endocrinologists' perspectives

Supervisor Names and Institute Affiliations:
Dr Siew Lim
Associate Professor Lisa Moran
Associate Professor Jacqueline Boyle
Dr Tracy Robinson
Monash Centre for Health Research and Implementation, School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia

I was lucky enough to undertake a Bachelor of Medical Science at the Monash Centre for Health Research and Implementation after my fourth year of Medicine. I have always been interested in research and how it impacts clinical practice, so tried to choose a project that combined this focus with some of my other interests, lifestyle and women's health. Completing a qualitative project, I have had to learn a lot of new skills (interviews, thematic analysis, NVIVO) and even different ways of thinking, as qualitative research requires you to reflect on not only your participant's perspectives and experiences but on your own and how they might influence your outcomes. The year was challenging and would not have been possible without a lot of support from my supervisors so, if I had any advice, it would be to pick a supervisor who suits you! This year was definitely rewarding, and I would recommend a BMedSc(Hons) to anyone considering it.

If you have any questions, I'm happy to answer them **lcbla2@student.monash.edu**

ABSTRACT

Background

Polycystic ovary syndrome (PCOS) is a complex, common, condition with reproductive, metabolic, and psychological manifestations and serious long-term chronic sequelae including type II diabetes and cardiovascular risk. These are exacerbated by obesity. The International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome released in 2018 recommends lifestyle management as first-line treatment for all presentations of PCOS given its capacity to improve PCOS symptoms and ameliorate long-term health risk. A number of practitioners are likely to be involved in PCOS management. Understanding the barriers and facilitators to the implementation of lifestyle management in each of these key stakeholder populations is important to best provide care for women with PCOS. A number of systemic and individual barriers to lifestyle management implementation exist in the general population and in general practice, however endocrinologists' perspectives on lifestyle management in PCOS have not been explored.

Method

Utilising a qualitative descriptive approach, underpinned by the constructivist worldview we gathered the perspectives of 11 endocrinologists registered with the Royal Australasian College of Physicians who saw women with PCOS from three subgroups (patient demographic: rural n=2, culturally and linguistically diverse n=6 and general population n=5). Semi-structured interviews were audio-recorded and transcribed verbatim. Analysis was conducted on NVIVO 12 Plus software using a reflexive thematic analysis approach.

Results

We report a comprehensive knowledge of PCOS and the role of lifestyle in PCOS among interviewed participants. Endocrinologists considered lifestyle integral to PCOS management, discussed it with all women with PCOS and considered lifestyle advice to be addressed well in the guidelines. Systemic barriers to the implementation of lifestyle management reported by endocrinologists included a lack of specific advice for PCOS, the poor fit between lifestyle management and specialist care, a lack of access to allied health and other lifestyle management services and training gaps in lifestyle management and PCOS. Individual practitioner barriers included practitioner sense of futility with lifestyle management, perceived poor patient motivation and adherence and a perceived patient sense of helplessness. Systemic facilitators included a team care approach utilising allied health referral through chronic disease management plans and credible sources of information. Individual facilitators included provision of tailored advice.

Conclusions

This study contributes to a growing body of evidence detailing health practitioner perspectives of barriers and facilitators to the implementation of lifestyle management for women with PCOS, by providing for the first time, endocrinologists' perspectives. Endocrinologists experienced a number of systemic and individual barriers to the implementation of lifestyle management in PCOS both specific to their circumstances and consistent with findings in general practice and the general population. These barriers must be addressed and current facilitatory practices strengthened in order to optimise health outcomes for women with PCOS. Development and trial of novel, co-designed models of care should incorporate these findings for best practice in PCOS lifestyle management.

Jacqueline Bredhauer

The acceptability and feasibility of point-of-care testing for hepatitis C in community pharmacies

Supervisor Names and Institute Affiliations:
Dr Joseph Doyle and Dr Alisa Pedrana, the Burnet Institute

I did my BMedSc(Hons) between third and fourth year because I was interested in exploring a different way of thinking and learning. I chose my project because hepatitis C elimination is an exciting area of research given that curative treatment as recently become available and because I liked the idea of conducting person-focused implementation research. I enjoyed my honours year even more than I thought I would, and I learnt so much! I learnt all about qualitative research and found that I really enjoyed the creativity that comes with this style of data analysis. I gained skills in self-directed work, adapting to unforeseen challenges, working across disciplines, academic writing, public speaking and beyond. I made new friends, and I loved being able to attend seminars at the Burnet Institute. My advice to future students would be to stay cool, calm and collected – something is definitely going to go wrong during your honours year, and that will be part of the learning experience! Make the most of a year when you can be creative and develop different thinking and learning skills; have fun! I am happy to be contacted by any students who have questions about public health, qualitative research, hep C or the Burnet Institute.

ABSTRACT

Background

Hepatitis C virus (HCV) causes morbidity and mortality through its long-term progression to liver cirrhosis and hepatocellular carcinoma. This chronic blood-borne virus is most commonly transmitted through injecting drug use, and thus has a high prevalence among people who inject drugs (PWID). PWID experience barriers to standard HCV care, stemming from personal difficulties as well as experiences of stigma and marginalisation in healthcare. New curative direct-acting antiviral therapy for HCV presents an opportunity to eliminate HCV as a public health threat, however low rates of diagnosis among PWID are impeding access to treatment in this population. Novel point-of-care (POC) tests for HCV allow for the delivery of care in convenient and familiar community-based settings. A proportion of PWID are engaged daily to weekly in opioid substitution therapy at their community pharmacies. Community pharmacies could thus be utilised to deliver accessible HCV care through POC testing.

Method

A qualitative sub-study was conducted within a randomised control trial that is piloting HCV POC testing in Australian community pharmacies (PharmEC). Interview schedules were designed according to Sekhon et al.'s theoretical framework of acceptability. A convenience sample of pharmacists working at PharmEC study sites were recruited, and data was collected through in-depth semi-structured interviews. Reflexive thematic analysis of transcribed interview data was conducted using a combination of deductive and inductive coding. A narrative was constructed using themes and relevant examples from the data sets.

Results

Of the fourteen PharmEC study sites, six pharmacists, representing six sites, participated in the interviews. Four themes were interpreted from the data: 'more than just a business', 'sustainable service delivery', 'convenience and utility'. And 'trust and safety'. Pharmacists referenced a 'desire to make a difference' and a 'desire to do more' as underpinning expressions of enthusiasm towards the PharmEC model. They expected that referrals to PharmEC's nurse-led model of POC testing would be simple to integrate into their workflow. They anticipated that HCV POC testing would provide a convenient and logical opportunity for their OST clients, and suggested that clients would feel safe and comfortable accessing HCV care in their pharmacies.

Conclusion

This initial work suggests that Australian pharmacists may be accepting of the prospect of facilitating HCV POC testing; that nurse-led models of HCV POC testing may be feasibly implemented into metropolitan, privately-owned pharmacies; and that pharmacists tend to build strong relationships with their OST clients that can be utilised to deliver interventions such as HCV POC testing. While further studies are needed, this initial research suggests that community pharmacies could be utilised to deliver HCV care in progression towards targets needed to eliminate HCV as a public health threat in Australia.

Imogen Brown

PRENIPT: The importance of ultrasound before cell-free fetal DNA testing in screening for fetal chromosomal abnormalities

Supervisor Names and Institute Affiliations:

Dr Shavi Fernando (Department of Obstetrics and Gynaecology, Monash Health, Monash University Dr Daniel Rolnik (Department of Obstetrics and Gynaecology, Monash University), Dr Melody Menezes (Monash Ultrasound for Women, Melbourne University)

I did my BMedSc(Hons) after finishing Year 4 in 2018. I chose to do a BMedSc(Hons) because I knew I was interested in Women's Health but I wanted more exposure in the field, and I also didn't feel quite ready to finish university. I was based at Monash Ultrasound for Women, where I did a study on doing an ultrasound before NIPT. I have learnt a lot this year; about research, teamwork but mostly time management and how to be self-directed. I have absolutely loved my year, it has been a great introduction to research and a fantastic opportunity to work with a research team that I will be working with into the future!

Feel free to contact me on
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ABSTRACT

Background

The use of cell-free fetal DNA testing (also known as NIPT) has relatively recently been introduced as routine screening for fetal chromosomal abnormalities in Australia. Despite extremely high sensitivities and specificities, false positives and false negatives can occur. Therefore, NIPT is not recommended in certain clinical circumstances, such as in the case of a demised twin or fetal structural abnormality. A pre-NIPT ultrasound is used to determine the viability of the pregnancy, the number of fetuses and their gestational age, viability and detect a demised twin or fetal structural abnormalities. The pre-NIPT ultrasound has been studied in an advanced maternal age (AMA) population, but no literature is available on the use of a pre-NIPT ultrasound in the general obstetric population.

Objectives

To determine the importance of a pre-NIPT ultrasound in the general obstetric population by recording the proportion of cases where patient management is changed due to findings on the pre-NIPT ultrasound.

Methods

A retrospective analytical study was performed at Monash Ultrasound for Women, a tertiary, private provider of obstetric and gynaecological ultrasound, prenatal screening and diagnosis in Melbourne, Australia. Individual patient files were reviewed and results were collated for maternal characteristics, reports of the pre-NIPT ultrasound, first and mid-trimester morphology ultrasound, additional ultrasounds, results and test characteristics of NIPT, as well as results of diagnostic testing and genetic counselling notes. The primary outcome was a potential change in patient management due to findings detected on the pre-NIPT ultrasound (non-viable fetus, ultrasound-based gestational age below 10 weeks, presence of fetal oedema, demised twin or a structural abnormality).

Results

Of 6,250 pre-NIPT ultrasounds, 6,207 were included in analysis. Of these, 9.7% of pregnancies had a finding on pre-NIPT ultrasound that had the potential to change patient management. Older women were more likely to have an unexpected finding detected at pre-NIPT ultrasound than younger women. A primary indication for NIPT (maternal preference or advanced maternal age) was present for 94% of women who undertook NIPT. In the hypothetical cohort of 10,000 women, $510,000 would be spent on pre-NIPT ultrasounds and $434,268 would be saved by not performing NIPT when it is inappropriate.

Conclusions

More than 500 women out of 6,207 avoided having inappropriate NIPT due to a finding on the pre-NIPT ultrasound. A pre-NIPT ultrasound had the potential to change patient management in nearly one in 10 women.

Isabella Cavalieri

Adjunctive estradiol treatment for depression in women with persistent schizophrenia

Supervisor Names and Institute Affiliations:
Professor Jayashri Kulkarni, Dr Carolyn Breadon; Monash Alfred Psychiatry Research Centre (MAPrc)

My name is Bella and I'm in between my fourth and fifth years of medical studies. I chose to undertake my honours year at MAPrc after being exposed to the department during my psychiatry rotation at the Alfred during fourth year. At that time, I had a general interest in psychiatry and was attracted to the style of research which was likely to be conducted in this field. I liked how it combined scientific research with exploration of theoretical and philosophical domains. I originally grew up in a small town in country Victoria. Like many fields, psychiatric care can be difficult to access in regional areas. I remain interested in different avenues of medicine and surgery and am not certain as to what training I'll undertake in the future. However, I see the value in respecting the field of psychiatry and bringing what I have learnt from my honours year alongside me throughout my career and my life. If that could improve the health and happiness of those living in country Australia, then I'd be stoked.

Any student is welcome to contact me if they have any questions about research in psychiatry or in general.
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ABSTRACT

Background

It is common for women with schizophrenia to experience co-morbid depression. Associations have been demonstrated between gonadal hormone levels and fluctuations and mental illness. Estradiol has been associated with improvements in psychosis and depression. The aim of this study was to explore the effects of adjunctive estradiol treatment on depression status in a population of women with treatment-resistant schizophrenia.

Method

This is a post-hoc analysis of data collected during an 8-week, three-arm, double-blind, randomised-control trial. 180 women were initially randomised to one of three groups: 200µg estradiol, 100µg estradiol or placebo. We analysed the participants from two of those groups: 200µg estradiol and placebo. All participants were aged between 18-45, and had a diagnosis of schizophrenia, schizophreniform or schizoaffective disorder with refractory symptoms despite being on a stable dose of antipsychotic medications. Psychotic symptoms were measured using the Positive and Negative Symptom Scale (PANSS), with a score >60 confirming residual symptoms. Depressive scores were measured with the Montgomery-Asberg Depression Rating Scale (MADRS), with depression defined as a MADRS score >18. MADRS scores were measured at days 0, 28 and 56.

Results

The depression status change between baseline and day 28 in those who received estradiol was statistically significant with a chi-squared statistic of 7.34 ($p = 0.01$). The proportion of patients with a depression status change after estradiol administration between baseline (day 0) and day 56 was not statistically significant ($p = 0.06$). Sub-group analysis of participants taking concomitant selective serotonin reuptake inhibitors (SSRIs) alongside estradiol demonstrated no improvement of depression status ($p = 0.50$).

Conclusion

Our results suggest that estradiol may have a beneficial effect on the clinical symptoms of depression in women with treatment-resistant schizophrenia. Concomitant use of SSRIs may negate the antidepressant properties of estradiol, though this requires further investigation.

Jilly Octoria Tagore Chan

Does the fibrinolytic capacity of plasma predict recanalisation and functional outcome after t-PA thrombolysis in patients with acute ischaemic stroke (AIS)?

Supervisor Names and Institute Affiliations:
Professor Robert Medcalf[1], Dr. Charithani Keragala[1]
[1]Monash University, Australian Centre for Blood Diseases, Melbourne, Australia.

Medical school introduced me to stroke and I quickly developed an interest in it. I thought it would be great if I could broaden my knowledge in the area. Thus, when the opportunity for me to do a research in the very field arose, I happily took it! Doing this project under the guidance of my terrific supervisors has easily been one of the best decisions I've made in my life. I've not only gained new lab skills but also other invaluable lessons in critical thinking and professionalism. However, that's not to say that my Honours year was free from trials and tribulations. I experienced plenty of those but in the end, they made my research experience more worthwhile.

ABSTRACT

Background

Intravenous tissue-type plasminogen activator (t-PA) is the only FDA-approved pharmacological treatment for ischaemic stroke. t-PA converts plasminogen into its fibrinolytic form, plasmin that can degrade fibrin clots and is a major component of the plasminogen activation system (PAS) that also includes important protease inhibitors, including α2- antiplasmin and plasminogen activator inhibitor 1 (PAI-1). t-PA also optimally activates plasminogen in the presence of fibrin which acts as an important cofactor. However, t-PA mediated recanalisation only occurs in <50% of patients and can be accompanied by a risk of symptomatic intracerebral haemorrhage (sICH). This highlights the inadequacy of the current eligibility criteria to guarantee a good clinical outcome. Only a few studies have investigated whether components of the PAS could predict the result of t-PA thrombolysis. As t-PA thrombolysis relies upon the ability of plasma to generate plasmin, we set out to see whether plasmin generation as reflected by the formation of plasmin-α2- antiplasmin (PAP) complexes after addition of t-PA ex-vivo was predictive of clinical outcomes post t-PA thrombolysis. Furthermore, ex-vivo and in-vivo PAP generation (i.e. post- thrombolysis) was compared to evaluate whether a positive correlation existed.

Methods

We evaluated 77 pre- thrombolysed patients' plasma samples received from an on- going clinical trial at the University of Newcastle. Additionally, we analysed 20 plasma samples (pre and post- thrombolysis at four different time-points: 1,2,12,24h) from Barcelona, Spain. PAP complexes formation were measured at baseline and after t-PA addition ex-vivo in the presence and absence of a soluble fibrin cofactor using an ELISA kit. An S2251 amidolytic assay was utilised to measure the rates of plasmin generation. Levels of α2-antiplasmin and plasminogen, PAI-1 and t-PA activity were also evaluated. Correlation studies were performed to assess whether any fibrinolytic markers predicted recanalisation and other clinical parameters.

Results

We observed marked variability in the capacity of patients' plasma to respond to t-PA in the presence and absence of + cofactor ex-vivo, and this was consistent between the two patient cohorts (~66 and ~63 fold range for Newcastle and Barcelona cohort respectively). There was a significant correlation between the degree of plasmin generated (as reflected by PAP complexes) ex-vivo and in-vivo at 1 and 2h ($p=0.0005$ and 0.0006 respectively) postt-PA thrombolysis. No significant correlations were found between any of the fibrinolytic markers and clinical outcomes, which may in part be due to the small sample size and limited clinical information provided.

Conclusions

There is a marked capacity for plasma obtained from patients with acute ischaemic stroke to respond to t-PA and generate plasmin. In particular, the individual variation in cofactor dependence to t-PA has not been reported and deserves further investigation. The limited clinical data available at writing this thesis, however, precluded any definitive correlation with either recanalisation rates or clinical improvement. This information will be forthcoming that will allow us to accurately determine whether plasmin generation as reflected by both ex-vivo inducible PAP generation and rates are predictive of postthrombolysis clinical outcome.

Cerys Chau

Patterns and predictors of inflammation in preschool children

Supervisor Names and Institute Affiliations:

Professor David Burgner – Department of Paediatrics, Monash University; Professor Richard Saffery – Murdoch Children's Research Institute; Ms Fiona Collier – Child Health Research Unit, Barwon Health; Ms Siroon Bekkering – Murdoch Children's Research Institute

I decided about 2 weeks before the deadline to do a BMedSc(Hons). Do not do what I did, and start asking around early!! In saying that, I have gained so much from this year, and would recommend it to anybody who is curious about research. Although it was a tough year, the growth I went through was so rewarding. I went from knowing nothing about a cytokine to writing a whole minor thesis about them. I was surrounded by supportive supervisors and wonderful colleagues, and got to experience a little bit of what it's like to do research at a prestigious institute. I learned how to use a statistical program from scratch (and wrote some pretty sexy code). Having free time to pursue other hobbies and work was a huge bonus. My advice to anybody who is considering a BMedSc(Hons) would be to make sure you know exactly what you are getting into – make sure it's a topic that is both feasible and engaging. It's also important to pick the right supervisor (how quickly they reply to emails is a good gauge of how involved they'll be).

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ABSTRACT

Background

Preschool children are frequently exposed to inflammatory stimuli, but data on innate immune signatures in this age group are scarce. Differences in innate immune response may influence the development of systemic inflammation underlying non-communicable diseases. Identifying factors that mediate these differences may inform preventive efforts. Innate immune responses are typically measured by incubating whole blood with an inflammatory stimuli to induce inflammatory cytokine production. We investigated the host and environmental predictors of cytokine production in response to two innate immune Toll-like receptor (TLR) stimuli in preschool children. We also examined the relationship between cytokine responses and GlycA, a biomarker of chronic inflammation not previously studied in this age group.

Method

Whole blood from 285 healthy preschool-age children (mean age 4.2 years) enrolled in the Barwon Infant Study was incubated with control medium, peptidoglycan (TLR2 ligand) and lipopolysaccharide (TLR4 ligand) for 24 hours. Pro- and anti-inflammatory innate cytokines were quantified by multiplex assay. Associations between cytokines were explored using Pearson's correlations. Linear regression was used to examine the influence of host and environmental factors including sex, age, growth and adiposity measures, season, socioeconomic status and recent febrile illness on cytokine responses. Where relevant, analyses were adjusted for monocyte proportion. Multivariate linear regression was used to determine associations between cytokine responses and GlycA. All statistical analyses were conducted using Stata 15.1.

Results

Pro-inflammatory cytokines demonstrated strong intercorrelation in each stimulation group, and TLR2-stimulated cytokines correlated with their corresponding TLR4-stimulated cytokines (r=0.19-0.64). TLR2-stimulated IL-12 and IL-10, and TLR4-stimulated IL-6, IL-12, IL-10 and IL-1Ra were higher in boys than girls, largely due to higher monocyte proportions. Baseline pro-inflammatory cytokines IL-1β, IL-6 and IL-8 were elevated in those who reported recent febrile illness. In contrast, TLR2-stimulated TNFα, IL-8, IL-12 and TLR4-stimulated IL-8 responses were blunted in children with recent fever. Other covariates were not associated with cytokine responses. BMI z-score and winter season were independently associated with GlycA. In analyses adjusted for age and sex, GlycA was associated with unstimulated IL-1β, IL-6, IL-8 and IL-1Ra; TLR2-stimulated IL-1Ra and TLR4-stimulated IL-1β, IL-6, IL-10 and IL-1Ra.

Conclusion

Established sex-based differences in cytokine response in adults may manifest from an early age, reflecting and contributing to differences in infectious burden. Children with recent fever have a unique inflammatory profile that may reflect innate immune compromise following febrile illness. Since other covariates were not found to associate with innate cytokine responses, other factors such as host genetics may play a greater role, and further investigation is required. This was the first study to examine GlycA levels in preschool children, and further investigation of the potential of GlycA as a biomarker of innate immune capacity in children is warranted.

Jeremy Cheng

What is the Role of ^{68}Ga-PSMA PET/MRI in the Detection and Localisation of Prostate Cancer? The SAMURAI Study

Supervisor Names and Institute Affiliations:
Associate Professor Jeremy Grummet: Department of Urology, Alfred Health
Professor Gary Egan: Monash Biomedical Imaging, Monash University

Hi, I'm Jeremy and I completed a BMedSc(Hons) after Year 4D in order to gain research experience before beginning my clinical career. I chose my project because of interests in urology and radiology, and because of the potential real-world impact that it had. During the year, I was privileged to work with world class PET/MRI technology and experts in the prostate cancer field. I gained enormous experience in conducting and analysing research, and was lucky enough to have the opportunity to present my work at medical conferences. The project was also a great mix of research and clinical work, allowing me to develop clinical and surgical skills throughout the year.

ABSTRACT

Background

The role of imaging in prostate cancer diagnosis is progressing at a rapid pace. Multiparametric Magnetic Resonance Imaging (mpMRI) has established itself as the gold-standard in disease detection and localisation. Positron Emission Tomography/Computed Tomography (PET/CT), designed to target Prostate Specific Membrane Antigen (PSMA) over-expressed by prostate cancer cells, has now entered the clinical realm of staging and restaging. PSMA PET/MRI is a novel hybrid imaging technique combining the strengths of each of the two modalities, and has shown initial promise in disease localisation and staging.

Objectives and Aims

1. To assess the diagnostic accuracy of ^{68}Ga-PSMA PET/MRI in the detection and localisation of primary prostate cancer, as compared to mpMRI and 68Ga-PSMA PET/CT, using prostatectomy specimens as gold-standard reference

2. To determine if ^{68}Ga-PSMA PET/MRI radiotracer uptake values correlate with disease severity.

Method

Patients with biopsy proven intermediate to high risk primary prostate cancer received ^{68}Ga-PSMA PET/CT as part of standard clinical care for disease staging, followed by ^{68}Ga-PSMA PET/MRI later the same day. Whole-mount histopathological analysis was performed on radical prostatectomy specimens, allowing for precise lesion localisation on a custom made 12-sector prostate map. 'Positive' lesions were defined as Grade Group 2 and above. mpMRI, ^{68}Ga-PSMA PET/CT and ^{68}Ga-PSMA PET/MRI results were also plotted onto the same map, and using histopathology as gold-standard reference, 2x2 contingency tables were created for each modality. PET/MRI tracer uptake values, in the form of Maximum Standardised Uptake Values (SUV_{max}) were compared to disease grade.

Results

20 participants underwent each imaging modality and radical prostatectomy, yielding 240 sectors for analysis. Histopathology revealed significant disease in all participants, with a total of 103 positive sectors. PET/MRI performed best at correctly identifying disease, with a sensitivity of 60.2%, compared to 53.4% and 43.7% of mpMRI and PET/CT respectively. Specificity was similar across all modalities: 94.9%, 94.2% and 93.4% of mpMRI, PET/CT and PET/MRI respectively.

Comparison of PET/MRI SUV_{max} and Grade Group demonstrated a statistically significant correlation coefficient of 0.485, indicating a 'moderate' positive relationship.

Conclusions

Our pilot study demonstrated that ^{68}Ga-PSMA PET/MRI was not only feasible in a clinical setting, but demonstrated superior diagnostic accuracy in disease localisation compared to ^{68}Ga-PSMA PET/CT and at least equivalent accuracy to mpMRI. Additional research is required to determine if SUV_{max} can be used as an objective test to predict disease severity. Therefore, PET/MRI has the potential to serve as an all-in-one imaging modality for prostate cancer detection, localisation and staging.

Amy Chew

Evaluation of a Novel, Non-Invasive Index of Microvascular Function in Patients with Myocardial Infarction and Non-Obstructive Coronary Arteries

Supervisor Names and Institute Affiliations:
Dr Yuvaraj Malaiapan, Dr Anthony White, A/Prof Dennis Wong; MonashHeart, Monash Cardiovascular Research Centre, Department of Cardiology.

After four years of medicine, I wanted to do something different and try my hand at research. I chose my project after meeting Tony and one of his past students at the info night last year. I'm not going to sugar coat it, BMedSc(Hons) wasn't the easiest or smoothest road. Our ethics wasn't approved until June by which stage, we only had 3 months to recruit and collect data. My biggest tip would therefore be to get ethics sorted ASAP (before you start your year if possible). And discuss with your supervisors the feasibility of your project, and contingency plans. On a positive note, there are lots of opportunities available and you get to meet heaps of new people, especially in your department. I had the chance to go to Adelaide this year to present a poster at conference – definitely one of the highlights. This year has also taught me how to be independent and resilient. You take ownership of the project and are usually the one who knows the most about it. It's been a busy year of ups and downs, but I'm glad I had the experience. Good luck!

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ABSTRACT

Background

Myocardial infarction with non-obstructive coronary arteries (MINOCA) is a heterogenous diagnosis whose underlying mechanisms, prognosis, and management are not well defined. Microvascular disease is a likely mechanism in some. Currently, the most practical and valid way to measure coronary microvascular function is invasively, using the Index of Microvascular Resistance (IMR). The coronary artery lumen volume to myocardial mass (V/M) ratio has been proposed as a novel, CT-derived, non-invasive measure of microvascular function.

Objectives

This study aims to determine the validity of V/M ratio in measuring microvascular function in a MINOCA cohort by comparing it to IMR.

Methods

Prospective study: We recruited a cohort of MINOCA patients identified from NSTEMI patients undergoing left heart catheterisation (LHC) at MonashHeart from 29 May to 31 August 2019. These participants underwent additional coronary physiology testing to measure IMR, Coronary Flow Reserve (CFR), and Fractional Flow Reserve (FFR). They also had a coronary CT angiogram (CTCA) performed within thirty days. The V/M ratio was derived from semi-automated analysis of the CTCA dataset. We compared IMR and V/M ratios to determine whether a correlation existed. We also compared V/M ratio and its components across abnormal and normal IMR.

Retrospective study: We conducted an analysis of patients who had already had both invasive physiology studies and a CTCA over the last ten years. We performed the same analyses. We also opportunistically analysed the daily catheterisation laboratory lists over the three months we were recruiting. We analysed the prevalence and baseline characteristics of MINOCA patients compared to obstructive NSTEMI patients.

Results

We prospectively recruited 12 NSTEMI patients. Six had non-obstructive disease on LHC, and three returned for a CTCA. Our retrospective cohort contained nine patients. In our prospective (n=3) and retrospective (n=9) cohort, we found no significant correlation between V/M and IMR (r=-0.92, p=0.26; r=0.27, p=0.48). Combining cohorts (n=11), we also found no significant correlation between V/M and IMR. On subgroup analysis, patients with abnormal IMR>25 demonstrated a significant correlation between V/M and IMR (r=-0.86, p=0.03). Patients with normal IMR<25 did not show a significant correlation. Those with abnormal IMR had a higher mean epicardial lumen volume (8.0mL$\pm$1.1mL, p=0.007) and myocardial mass (168.1g$\pm$15.5g, p=0.001) than those with normal IMR.

Compared with obstructive NSTEMI patients, MINOCA patients were more often female (82.4%, p<0.01), presented more frequently with atypical or no angina (47.1%, p=0.04), and had better renal function (eGFR=88, IQR=8, p<0.01; Cr=64, IQR=14, p<0.01). They also had a shorter length of stay (3 days, IQR=3, p<0.01), were less frequently discharged on cardioprotective medication (5.9%, p<0.01) and referred for cardiac rehabilitation (35.3%, p<0.01).

Conclusion

Our study was the first to compare V/M ratio with IMR. At present, our samples are small and underpowered. Our preliminary findings show no significant correlation between V/M and IMR. However, subgroup analysis suggests that its relationship is more complex than previously thought. The MINOCA patient profile is different from that of obstructive NSTEMI patients. It should be considered as a separate working diagnosis requiring different investigation and management.

Steven Clare

Timing of surgery after traumatic thoracolumbar spinal cord injury

Supervisor Names and Institute Affiliations:

Professor Biswadev Mitra: School of Public Health and Preventive Medicine, National Trauma Research Institute, Emergency & Trauma Centre (The Alfred Hospital)

A/Professor Susan Liew: Department of Orthopaedic Surgery (The Alfred Hospital)

A/Professor Jin Tee: Department of Neurosurgery (The Alfred Hospital), National Trauma Research Institute.

I completed a BMedSc(Hons) after finishing fourth year. I chose a topic in spinal surgery as it allowed me to combine my interests in trauma, neurosurgery and orthopaedics. I was drawn to this particular project as it seemed manageable whilst still addressing quite a contentious area of research. I decided to undertake this project with my primary supervisor (Professor Mitra) as he was very responsive and approachable and had supervised students previously, with a good track record of his students producing work of a publishable quality. Overall, this has been the most memorable year of my degree. Whilst my project was challenging, it made for an interesting and satisfying year. I am very grateful to all my supervisors, whose mentorship and support this year has been invaluable and has fostered an ongoing interest in research for me in the future. Aside from gaining essential research skills, some of the most rewarding experiences for me were during the time I spent clinically with my supervisors in the Alfred Trauma centre or in surgery. Additionally, I was able to contribute to other projects throughout the year which made for a more diverse and memorable experience.

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ABSTRACT

Background

Spinal cord injury is rare, but devastating. After traumatic spinal cord injury, prolonged compression of the spinal cord by bone fragments as well as inflammation exacerbates neurological injury. Surgical intervention facilitates decompression of the spinal cord as well as restoration of the structural integrity of the vertebral column. Based on evidence from animal studies, timely surgery may allow the preservation of additional spinal neurons, leading to improved neurological outcome. Some authors however, have raised concerns about the safety and efficacy of early surgery. Early surgical intervention has been demonstrated to improve neurological outcomes in the cervical region after traumatic spinal cord injury. Evidence in the thoracolumbar region however, is less clear and requires further research.

Method

A single centre retrospective cohort study was undertaken analysing patients at The Alfred Hospital undergoing surgery for traumatic thoracolumbar spinal cord injury between January 2009 and December 2018. Patients were divided into two groups: an early surgery group undergoing surgery < 24 hours after injury and a late surgery group operated on ≥ 24 hours. The primary outcome was ≥ 1 improvement in American Spinal Injury Association (ASIA) grade, assessed at time of hospital discharge. Secondary outcomes were complication rates, intensive care unit length of stay (ICULOS) and hospital length of stay (HLOS).

Results

71 patients met criteria for final inclusion, with 38 patients in the early group and 33 patients in the late group. Overall, an ASIA conversion (ASIA Grade improvement) of ≥ 1 occurred in 14 of 71 patients (6 in the early intervention group and 8 in the late intervention group). An ASIA conversion of ≥ 2 occurred in 4 patients (2 in each intervention group). One patient in the late group experienced neurological deterioration (assessed as ASIA B preoperatively, changing to ASIA A post-operatively). For the primary outcome (≥ 1 grade improvement in ASIA scale), an age-adjusted odds ratio of 1.61 (95% CI: 0.47 – 5.51; p = 0.45) was calculated. Therefore, there was no statistically significant effect of surgical timing on neurological outcome observed. Overall, there were low rates of complications seen amongst the study group. There was also no statistically significant difference found between groups for hospital length of stay (p = 0.11) or ICU length of stay (p = 0.86).

Conclusions

Timing of surgery has no apparent impact on neurological outcomes at time of hospital discharge, although the possibility of a clinically significant effect on long term recovery cannot be excluded.

Andrea Comella

An assessment of endothelial dysfunction in patients with severe aortic valve stenosis

Supervisor Names and Institute Affiliations:
Supervisors:
- Dr. Adam J Brown[1,2,3]
- Prof James D Cameron[1,2,3]
Monash University[1]
Monash Cardiovascular Research Centre[2]
Monash Health[3]

During my 4 years of medical school I had little exposure to research, and I knew I wanted to have a taste about what research was about. Therefore, after completing 4th year I decided to undertake a BMedSc(Hons) year. Since year 3 I have developed an interest in Cardiology so I undertook my BMedSc(Hons) year at MonshHeart under the supervision of Dr. Adam J Brown and Prof. James D. Cameron. This year has been a very important one in regard to my medical training. I have been given opportunities to develop both my clinical and research skills. I have had the pleasure to get involved in other projects and present both at national and international conferences. Most importantly I have had the chance to network with specialists in the field I am interested in. Additionally, taking a year off and focus solely on research gave me the chance not only to develop new skills but also to become more creative and start thinking about new ideas or projects to get involved in. I think that this year has confirmed to me that I want to keep active in research as it stimulates me and encourages me to grow further.

ABSTRACT

Background

Patients with severe aortic stenosis (AS) have impaired coronary flow reserve (CFR), resulting in myocardial ischaemia in the absence of obstructive coronary artery disease. Endothelial dysfunction (ED) contributes towards impaired CFR in patients with AS, although it remains unknown whether endothelial function recovers following relief of valvular obstruction. It is also unclear whether any hypothesised improvement can occur immediately as consequence of arterial haemodynamics or more long-term due to myocardial structural adaptations.

Method

Patients with severe AS undergoing transcatheter or surgical aortic valve replacement had assessment of endothelial-independent and -dependent flow mediated dilation (FMD) via ultrasound and EndoPAT2000. Measurements were performed prior to, 24hrs after and 28 days after valve replacement. Intraobserver FMD reproducibility was excellent (intraclass correlation coefficient 0.96, $p<0.001$).

Results

30 patients were recruited into the trial (33% female), with twenty-seven (90%) patients undergoing transcatheter valve replacement. FMD significantly increased from $4.6\pm2.2\%$ (pre-) to $9.9\pm3.3\%$ 24hrs post-procedure ($p<0.0001$). FMD follow-up data at 28 days demonstrated that the improvement was sustained when compared with pre-AVR ($8.7\pm11.9\%$, $p<0.0001$). EndoPAT measures show a similar trend in improvement, although this did not reach statistical significance ($p>0.05$). However, change in reactive hyperaemic index measured on EndoPAT showed a moderate correlation to change in FMD ($r=0.36$, $p=0.015$). Baseline wall shear stress (WSS) decreased significantly at 1 month (16.0 ± 8.4(dyn)/cm2 vs. 11.1 ± 5.5(dyn)/cm2, $p=0.01$).

Similarly, cumulative WSS, represented as AUC, also decreased significantly at 1 month (3665 ± 1810(dynxs)/cm2 vs 2558 ± 1101(dynxs)/cm2, $p=0.001$). This decrease in WSS resulted in restoration of normal brachial artery physiology. This allowed the endothelium to respond to changes in WSS by

vasodilating as demonstrated by the correlation between AUC and FMD at 1 month follow up ($r=0.46$, p-0.02) which was impaired before AVR ($r=0.01$, $p=0.94$).

Conclusions

Our data shows that endothelial function in patients with AS improves with 24h after relief of valvular obstruction. We hypothesise that this likely occurs as a result of improved arterial haemodynamics which leads to lower WSS.

This improvement may result in restoration of CFR and alleviate myocardial ischaemia.

Daniel Christovery Darmaputra

Cost-Effectiveness of Opportunistic Influenza Vaccination of General Medicine Inpatients

Supervisor Names and Institute Affiliations:

Supervisor: Dr Ar Kar Aung General Medicine and Infectious Diseases Physician, Director of Physician Education and Director of Advance Training for General and Acute Care Medicine Training – The Alfred Hospital Adjunct Senior Research Fellow – School of Public Health and Preventive Medicine, Monash University

Co-Supervisor: Professor Danny Liew

Clinical Pharmacology and General Medicine Consultant Physician – The Alfred Hospital Deputy Head (Education and Enterprise), Chair of Clinical Outcomes Research and Co-Director of the Centre of Cardiovascular Research and Education (CCRE) – School of Public Health and Preventive Medicine, Monash University

Hi, I'm Daniel, a fourth year medical student from Universitas Indonesia. I have taken interest in health economic subject. This year I had the opportunity to study the health economic aspect of influenza vaccination. I was very grateful to have supervisors who are experts on this field of study. Throughout the year, I had many opportunities to study more about health economic and gained valuable knowledge on how to conduct a research project. Also, I want to express greatest gratitude to fellow staff and colleagues in SPHPM for their support and insights in completing my research project. For future students, I would recommend the BMedSc(Hons) year so you will be amazed that you are actually able to conduct a research and write thesis.

If you are interested in BMedSc(Hons) or maybe to do research at SPHPM, I am open to answer your questions — **danielchristovery@gmail.com**
Cheers!!

ABSTRACT

Background

Influenza imposes a significant burden of disease in Australia and globally. Certain groups such as the elderly and people with chronic diseases are at higher risk of influenza infection and its complications. Seasonal influenza epidemics can be prevented, and cases of influenza infection reduced, by annual vaccination. Previous studies have found that general medical inpatients, a high-risk group by virtue of age and co-morbidities, are eligible to be opportunistically vaccinated while they are 'captive' in hospital. However, there is no current evidence of the effectiveness and cost-effectiveness of such a strategy.

Aims

The aim of our study was to estimate the potential effectiveness (in terms of reduction in rehospitalisation) and cost-effectiveness of opportunistic influenza vaccination of general medical inpatients.

Method

Our study comprised of two parts. First, a retrospective cohort study was undertaken to describe rehospitalisations among a group of people initially admitted to the general medical unit of the Alfred Hospital between July and September 2017. Rehospitalisations, and their costs, were captured until 31 December 2018. Secondly, we undertook a cost-effectiveness analysis of opportunistic influenza vaccination of the subgroup of patients who were eligible for this intervention during the index admission in 2017. Decision analysis was applied that compared observed outcomes against a hypothetical scenario of opportunistic vaccination. Efficacy data in terms of reduction in the risk of hospitalisation with vaccination, as well as cost data, were drawn from published sources.

Results

Among the 199 study participants, the median (IQR) age was 79 (72-87) years, with 51.3% being males. Fifty-six (28%) of the study participants were eligible for vaccination during the index admission. The mean number of readmissions for any reason in this group over the median 17-month period of follow-up was 2.16, at a mean cost of (AUD) $11,936. If the inpatient influenza vaccination coverage was achieved at 67%, along with an expected 4% reduction in the risk of readmission the mean number of readmissions from all causes would reduce to 2.10, and there would be a cost saving of $320 per person over the follow-up period. Opportunistic vaccination was estimated to cost $18 per person, meaning the net saving would be $302 per person vaccinated. In a sensitivity analysis that assumed a cost of $40 per vaccination, cost savings were reduced to $280 per person. In terms of costs per year, there would be an expected cost saving of $214 per person per year if vaccination cost was $18, or $192 per person per year if vaccination cost was $40.

Conclusions

The results of our study support a strategy of opportunistic influenza vaccination of eligible general medical inpatients, among whom the risk of rehospitalisation is high. Opportunistic vaccination is likely to be cost-saving.

Seema Deb

Improving the delivery of Medical Termination of Pregnancy in Australian general practice: what models of care work?

Supervisor Names and Institute Affiliations:
Professor Danielle Mazza, Doctor Asvini Subasinghe Department of General Practice, School of Primary Health Care, Monash University

I chose to do a BMedSc(Hons) year after finishing year 4C in 2018. My decision to do a research year was mainly to see what research was like, and whether I enjoyed it! I have an interest in women's health and general practice, and this project sat perfectly between them. I've not only gained an understanding of what research can involve, but have a better grasp of the different types of research there are. I had no idea what to expect with doing a qualitative research project, but I've found the whole analytical/interpretative process very interesting and engaging. Some advice I have for future students is to choose a topic you're interested in, as well as speak to your potential supervisor(s) about what the project actually involves day to day! You'll be better equipped to decide about potential projects that way.

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ABSTRACT

Background

Medical termination of pregnancy (MToP) is the use of medical abortifacients, namely mifepristone and misoprostol, to end a pregnancy. General practitioners (GPs) are ideally placed to provide MToP services as women commonly seek GP counsel for sexual and reproductive health concerns. However, despite medical abortifacients being available on the Pharmaceutical Benefits Scheme since 2013, integration of MToP into general practice has been slow. GPs have called for assistance in initiating MToP service delivery, but have limited knowledge of models of care to inform their provision. We aimed therefore to describe the models of care used by current GP MToP providers and to obtain the perspectives of providers regarding how GP MToP provision could be improved.

Method

A qualitative-descriptive design was used, which followed a pragmatic approach. Twenty five GP MToP providers participated in semi-structured audio-recorded, telephone interviews. We purposively sampled using three strategies: advertisement on a special interest Facebook group, snowballing and invitation to MToP providers listed publicly online. Following verbatim transcription, data were managed in NViVo 12. Thematic analysis with two coders was used to develop themes and subthemes.

Results

GP MToP providers focussed on issues concerned with establishing a service, how they logistically delivered the service and what they felt could support service delivery. Establishing MToP services involved the decision to communicate MToP provision (or not), and putting in place a network of other health professionals who could assist. These networks involved pharmacists, sonographers, local hospital staff, as well as other MToP providers. MToP providers acted as a community, supporting each other and exchanging knowledge between providers. Participants described four distinct approaches to MToP service provision: common, streamlined, task-sharing and ultrasound inclusive. There was large variation in: the charge set by providers for the service; the time they spent undertaking MToP provision; how they sourced anti-D (a difficulty for many), and their approach to follow-up. Finally, GP providers felt resources such as printed patient information and increased education for all GPs (providers and non providers) were necessary. Additionally, GP providers believed changes to the Medicare Benefits Schedule in relation to MToP, would encourage more GPs to provide MToP.

Conclusions

This is the first study in Australia to describe GP MToP models other than task-sharing with nurses. The information provided may serve as a much-needed resource to encourage GPs to initiate provision. The lack of knowledge for GPs as a collective, is profound and necessitates changes to curriculum and/or increased educational opportunities for GPs. Our findings suggest the importance of replacing informal community of practices such as the Facebook group, with a formalised platform, for easily accessible support, education and encouragement, of both current and future MToP providers.

Hamish P Evans

Impact of Iron Deficiency on Haemoglobin and 30-Day Functional Outcomes in Adult Trauma Patients

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Me: A quick note on me: I'm (now) final year MD/BMedSc. In my down time (of which I had plenty this year) I'm a bike builder and cyclist, boulderer, self-proclaimed chef, and household handyman. My Project: I have known since the start that surgery is my target, however when choosing my project, I didn't want to research something that was hyper-specific to a single specialty. Hence, anaemia, one of the most widely applicable topics in medicine, and also a very hot topic right now (and evidently pretty poorly managed). I also don't want to be one of those surgeons that's just "eat, sleep, operate, repeat". I want to be able to manage all perioperative aspects of my patients. Where better to learn these skills than in theatre with anaesthetists, the perioperative specialists. My advice: To future students, choose a project that when the proverbial s*#% hits the fan, you will want to be the one to fix it. Not that you'll want it fixed, but that you'll be so interested in what you might find at the end of the year, that you'll want all the work to be yours, and you'll want to earn that first authorship. Happy to chat if you want to know more.

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ABSTRACT

Background

Up to 97% of critically ill patients are anaemic within a week of admission to hospital. Anaemia has been associated with increased morbidity and mortality in multiple patient groups. Among the general population it is thought that iron deficiency accounts for 50% of cases of anaemia. Over 40% of intensive care unit patients are iron deficient on admission to hospital, a condition associated with lower admission haemoglobin, longer ICU length of stay and higher rates of blood transfusion, as well as fatigue, muscle weakness and decreased exercise capacity.

Previous publications have analysed the various relationships between anaemia, red cell transfusion, morbidity & mortality, iron deficiency and iron supplementation, among critically ill patients. However, few-to-none have investigated the correlation between iron status and the rate at which haemoglobin returns to non-anaemic levels in traumatic critical illness, nor have they clearly identified whether or not iron status affects functional outcomes following trauma.

Aims

To characterise the relationship between iron deficiency, haemoglobin normalisation and functional recovery in anaemic trauma patients.

Method

Trauma patients who were anaemic - as defined by current WHO criteria - within 24 hours of admission to the Alfred Hospital were recruited and observed throughout their hospital stay. Results of select blood tests – haemoglobin, iron studies and c-reactive protein - were abstracted from medical records and entered into a database at recruitment and every five days for the duration of Alfred Hospital admission, and on discharge. Treatment details pertaining to surgical management, quantity of red cell transfusion and type of iron therapy were recorded at these intervals. Once medically stable, participants were visited and undertook functional questionnaires (WHODAS 2.0 and EQ-5D-5L) to determine baseline functional status prior to the trauma that resulted in hospital admission. These functional questionnaires were repeated at 30- days post-admission. Participants who had suffered a traumatic brain injury were excluded from functional investigation as they would be unable to answer questions concerning functional status.

Results

90% of participants were anaemic on discharge from hospital and 84% were iron deficient at one or more time points throughout admission. Participants who were admitted to ICU were less likely to remain anaemic on discharge, but more likely to be iron deficient and to undergo red cell transfusion. The study was unable to detect a difference in time to haemoglobin normalisation, nor was it able to identify a difference in the risk of remaining anaemic on discharge from hospital, between iron deficient and non-iron deficient participants. Functional outcome data collection is ongoing.

Conclusions

Persistent anaemia on discharge from hospital is extremely prevalent among trauma patients. This suggests that current management of anaemia is insufficient and may be putting patients at an increased risk of morbidity and mortality. Furthermore, iron deficiency is very common among trauma patients and, according to previously published literature, may contribute significantly to the prevalence and severity of anaemia in this cohort. Iron deficiency may also negatively impact functional outcomes. A future trial of intravenous iron vs placebo could provide evidence for a change in management of anaemia in critically ill patients.

Madeline Flanagan

Independent participant data meta-analysis on the prediction of adverse perinatal outcomes using maternal characteristics and Doppler ultrasound

Supervisor Names and Institute Affiliations:

Professor Ben Mol, Dr Daniel Rolnik (Monash University), Dr Charlotte Vollgraff Heidweiller- Schreurs, Dr Wessel Ganzevoort (Academic Medical Centre Amsterdam)

Hi there! My name is Madeline, and after completing this BMedSc(Hons) year I am going into final year Medicine in 2020. I chose to undertake an Honours year to dip my toe into medical research, to see if I liked research and to challenge myself. This Honours year has been fantastic! While testing at times, I have learnt about the research process, and luckily, I had the amazing opportunity to combine academic goals with travel. I travelled to Amsterdam to work with Ben's Dutch colleagues in the obstetrics department at a major city hospital as part of my project which aimed at evaluating detection methods for fetal growth restriction. I would thoroughly recommend doing a BMedSc(Hons) degree, this year has allowed me to grow enormously, both professionally and personally. Please feel free to contact me with any further questions about my year!

ABSTRACT

Background

To develop a prediction model for adverse perinatal outcomes using maternal characteristics, fetal biometry and Doppler ultrasound findings, including UA PI, MCA PI, CPR and mean uterine artery PI. The secondary aim was to assess the predictive value of the model in different subgroups according to gestational age and fetal birth weight.

Method

In a pooled re-analysis of individual participant data (IPD), we developed and compared six predefined prediction models: Model 1 used maternal characteristics (age, parity, smoking status and BMI) and gestational age at ultrasound test; model 2 included EFW percentile in addition to the variables from model 1; Doppler ultrasound measurements were subsequently added in steps, starting with the addition of UA PI in model 3; MCA PI in model 4; CPR measurement replaced UA PI and MCA PI in model 5; model 6 used UA PI and MCA PI with the addition of mean uterine artery PI. The primary outcome was a composite adverse perinatal outcome (defined as at least one of perinatal mortality, emergency cesarean section for fetal distress or neonatal admission). We performed subgroup analyses according to gestational age (GA) at delivery < vs ≥ 37 weeks, birth weight (BW) percentile (<10th vs 10th-25th vs ≥25th) and estimated fetal weight (EFW) percentile (<10th vs ≥ 10th).

Results

Overall, 3042 participants from three datasets could be included in the analysis. In the overall group, discriminative ability in terms of AUC was similar between the different models (range 0.60-0.64). In pre-term cases and small-for-gestational age cases, we noted that the discriminative ability improved with the model including UA PI, with AUC ranging from 0.65-0.74 (BW <p10), 0.68-0.75 (EFW <p10), and 0.72-0.78 (GA <37 weeks). Within these subgroups, the models that incorporated uterine artery Doppler ultrasound measurements significantly increased the predictive ability of the model (GA<37 weeks: ΔAUC= 0.6; BW<p10: ΔAUC= 0.7; EFW <p10: ΔAUC= 0.5). The models that replaced UA PI and MCA PI measurements with CPR measurements had no added predictive value (GA<37 weeks: ΔAUC= -0.1; BW<p10: ΔAUC= 0; EFW <p10: ΔAUC= 0) Across all subgroups, the model with the highest predictive ability included UA PI, MCA PI and mean uterine artery Doppler ultrasound measurements (GA<37 weeks: AUC 0.78, 95% CI: 0.73-0.84; BW <p10: AUC 0.74, 95% CI: 0.68-0.80; EFW <p10: AUC 0.75, 95% CI: 0.68-0.82).

Conclusions

In this study, Doppler ultrasound of the UA PI added most predictive value to a model with maternal characteristics and fetal biometry in pre-term pregnancies with small fetal size, while UA PI added limited predictive value in term pregnancies or normally grown fetuses. The addition of MCA PI and mean uterine artery PI increased the predictive ability of the model, however the added value was less than that of UA PI. Replacement of UA PI and MCA PI with CPR did not add predictive value irrespective of the gestational age or fetal size.

Salwa Auliani Gautama

What is The Role of Surgical Interventions for Gastro-Oesophageal Reflux Disease and Gastroparesis following Lung Transplantation?

Professor Wendy Brown — Department of Surgery, Central Clinical School
Mr. Paul Burton— Department of Surgery, Central Clinical School
A/Prof. Glen Westall — Department of Respiratory Medicine, Alfred Health

Hi! I'm Salwa, I'm a 4th year med student from Universitas Indonesia. My project was a clinical-based study on the effects of anti-reflux surgery following lung transplantation. It was unique in the way that I get to integrate my work within two different departments. My wonderful supervisors were extremely supportive and helpful, but they encouraged me to be independent and to take charge of my project, which made all the work I've done this year feel more rewarding. Honours was challenging, but it's also a year for growth — I learned to focus on the solution instead of the problems, learned research skills as well as statistical skills. I am tremendously grateful for all the support and help I've received from the Alfred Health lung transplant team and Department of Surgery, the great clinical experience and of course, making good friends along the way. To future honours students, it's not always easy, but all your hard work and dedication is going to pay off in the end. Don't forget to enjoy yourself along the way and be open for new learning experiences!

ABSTRACT

Background

Delayed gastric emptying, or gastroparesis, and gastro-oesophageal reflux disease (GORD) are common complications of lung transplantation. Both gastroparesis and GORD play key roles in the development of respiratory decline and subsequent chronic allograft rejection, through aspiration of gastric contents. Surgical intervention through fundoplication for GORD and therapeutic gastroscopy for gastroparesis, is the only therapy alleged to be able to protect patients' respiratory function. However, the safety profile of these interventions and their efficacy in a susceptible patient cohort, are yet to be established.

Aims

This study aims to assess the efficacy of fundoplication and therapeutic gastroscopy in lung transplantation patients through rate of change in Forced Expiratory Volume in 1 second (FEV1), symptomatic improvements and dose of medications; as well as assessing safety through rates of complications, one-year hospital admissions, and survival.

Method

Retrospective analysis of lung transplantation patients who underwent fundoplication and therapeutic gastroscopy from 2007 to 2018 in Alfred Health was done. Rate of change in FEV1 was obtained from slopes between baseline and pre and post-operative FEV1 values within a six-month interval. The most recent pre and post-operative symptoms and dose of medications were recorded from clinical records. Times admitted to operating theatre, unplanned ICU admissions, and inpatient hospital stay days within one-year pre and post-operatively were collected from discharge records. Survival rates were analysed and compared with non-intervened lung transplantation patients from an existing global registry.

Results

Thirty-four patients underwent fundoplication, with a mean follow-up of 6.37 ± 3.29 years post-transplantation. Patients with no chronic rejection at the time of operations had a significantly improved rate of change in FEV1 ($p = 0.0036$). Thirty-one patients underwent therapeutic gastroscopy, with a mean follow-up of 3.7 ± 1.59 years post-transplantation. The general rate of change in FEV1 improved in these patients ($p = 0.0003$), especially in patients with no chronic rejection ($p < 0.0001$) and in patients who had therapeutic gastroscopy < 6 months post-transplantation ($p = 0.0005$). Typical and atypical symptoms of reflux improved significantly following fundoplication, while only minimal symptomatic improvements were seen following therapeutic gastroscopy. There were 7.9% major early complications and 15.8% major late complications following fundoplication. No major complications occurred following therapeutic gastroscopy. No significant changes in hospital admission rates were seen in both patient groups. There were significant improvements in survival rates following both procedures, with no surgically-related mortalities.

Conclusions

Fundoplication can improve respiratory function for patients with no prior rejection. Therapeutic gastroscopy is especially beneficial for the respiratory function of patients with no chronic rejection and if done earlier. Both procedures are safe to be done following lung transplantation, with minimal complications and no surgically related mortality. Ultimately, these procedures are safe, viable choices to control post-transplantation gastroparesis and GORD. Finally, patient selection should be highly considered before the procedure to prevent aspiration-related sequelae without compromising patient welfare.

Anastasia Gavrilescu

Assessment of the Antimicrobial Stewardship Program at the Alfred Hospital: A controlled Interrupted Time series

Supervisor Names and Institute Affiliations:
Professor Allen Cheng
Dr Andrew Stewardson
Monash School of Public Health and Preventative Medicine

Infectious Disease Epidemiology unit
Alfred Health
Monash University

Hi everyone! I am a Deakin university postgraduate medical student, who completed year 3 in 2018 in Geelong. I previously completed a Bachelor of Science at Monash university with a Major in Physiology and Minor in Biochemistry and Psychology. After a year of clinical medicine, on a background of three years of science I felt drawn to gain more research experience. I wanted to gain knowledge in research methodology so I could feel more confident in drawing accurate conclusions from research articles, and in being able to evaluate the quality of the medical evidence on which our guidelines are based. I chose this project based on its broad applicability to all fields of medicine. It allowed me to learn how to evaluate a hospital-based intervention, when randomised controlled trials are not ideal. Further, I also gained confidence and experience in statistical analysis as well as the limitations of this, which will assist me in evaluating the quality of research articles in future. I am extremely grateful to have worked on this project with my supervisor who was very engaged in the project and approachable throughout the honour's year.

Please contact me if you have any questions **on agav3@student.monash.edu** (for 2019), **and agavrile@deakin.edu.au** (for 2020).

ABSTRACT

Background

Antimicrobial resistance (AMR) is a global public health issue. The inappropriate use of antimicrobials contributes to AMR by placing a selection pressure on resistant organisms. In response, hospitals have employed the use of antimicrobial stewardship programs (AMSP) to facilitate appropriate prescribing, as a means of preserving the effectiveness of antimicrobials.

Setting

Alfred Health, a tertiary teaching hospital providing care to specialised patient populations, introduced an AMSP in January 2011. This involved use of antimicrobial stewardship (AMS) ward-rounds to review the appropriateness of target broad-spectrum antimicrobial prescriptions, and restriction of complex antimicrobials. Patients under the care of intensive care unit, lung transplant unit and haematology unit were not formally reviewed by the AMS team due to infectious disease (ID) consultations being embedded in these treating teams. Monitoring the effectiveness of the AMSP is essential to ensure efforts to control AMR are successful. However, the number of factors impacting antimicrobial use makes it difficult to isolate the impact of the AMSP.

Hypothesis and Aims

Thus, this study aimed to measure the effectiveness of the Alfred hospital AMSP in reducing the use of broad-spectrum antimicrobials (grouped by CDC definitions) through the use of a controlled interrupted time series (CITS) to adjust for the presence of confounding variables. It was predicted adjustment for these factors would demonstrate a significant reduction in the consumption of broad-spectrum antimicrobials.

Method

Antimicrobial consumption data was obtained from hospital purchasing and distribution records and standardised to the world health organisation (WHO) metric of defined daily dose per 1000 occupied bed days (DDD/1000 OBDS). A CITS was performed to assess the impact of the Alfred-AMSP in reducing the consumption of broad-spectrum antimicrobials. This involved comparing the level and rate of antimicrobial consumption in the control group (Narrow spectrum beta lactams) to the consumption of the intervention groups in the pre and post-intervention period (01/01/2008- 01/04/2018).

Results

A significant sustained reduction (-5.26% per-year) in the consumption of broad-spectrum antimicrobials used for community acquired infections (BSCA) was identified, with a significantly decreasing post intervention trend (-3.77% per-year). Antimicrobials associated with a high risk of Clostridium difficile infections (CDI) were found to have a significant immediate reduction in consumption (-14.55%), and a significantly reducing post-intervention trend (-2.25% per-year), but the change in trend (-4.46% per-year) was not significant. Similarly, antibiotics active against methicillin resistant Staphylococcus aureus (Anti-MRSA) antimicrobials had a significantly decreasing post-intervention trend of (-3.07% per-year), but the immediate reduction (-8.53% per-year), and the sustained reduction of (-4.64% per-year) was not found to be significant. No significant changes in the consumption of broad-spectrum antimicrobials for hospital-acquired infections (BSHA) were identified.

Conclusion

The reduction of BSCA suggest the direct component of the Alfred-AMSP, including daily AMS ward-rounds to review the appropriateness of antimicrobial prescriptions is an effective means to reduce unnecessary antimicrobial consumption. Conversely, the lack of reduction in BSHA antimicrobials suggest the indirect component of the Alfred-AMSP, involving ID consultations for specialised populations could be reviewed. Further, the Alfred-AMSP could review inclusion of more antimicrobials which increase the risk of CDI in its target-antimicrobials list.

Taran Giddey

Saccadic Eye Velocity across the Menstrual Cycle

Supervisor Names and Institute Affiliations:
Dr. Caroline Gurvich, Dr. Natalie Thomas, Dr. Elizabeth Thomas. Monash Alfred Psychiatry Research Centre.

I went into BMedSc(Hons) after 4th year. From my psychiatry rotation I developed a keen interest in mental health and wanted to take my research year as an opportunity to explore this interest. I contacted MAPrc after a recommendation from my psychiatry supervisor in Mildura. I ended up doing my research project in the Women's Mental Health Team. This team works on the forefront of developing an understanding of how hormones play a pivotal role in women's mental health and how accordingly, there should be a focus on hormones in the treatment of women with mental ill health. Along with this, the team is so incredibly warm and welcoming. The combination of these factors led to an extremely rewarding research year, which has encouraged me to pursue research in my career going forward. I have developed much respect and admiration for my supervisors, and real friendships with the other students at MAPrc. I will greatly cherish the memories of this year and encourage others who are interested in mental health research to contact my supervisors.

ABSTRACT

Background

Across the menstrual cycle, women experience various psychological and physical symptoms of premenstrual distress. Premenstrual syndrome (PMS) and Premenstrual dysphoric disorder are severe conditions of premenstrual distress affecting 45% and 8% of women respectively. Current first-line treatments for PMS and PMDD are the oral contraceptive pill or selective serotonin re-uptake inhibitors. Response rate to current treatments (<60%) can be improved. Other central nervous system pathways involved in pathophysiology of PMS/PMDD have been explored as targets of new treatments. The gamma-aminobutyric acid (GABA) pathway has showed promising results in relation to novel treatments and more broadly its involvement in premenstrual distress pathophysiology. A number of studies have shown that peak saccadic eye velocity (pSEV) can be affected in different ways across the menstrual cycle and different premenstrual distress patient groups. pSEV is a known measure of GABA function. Current literature relating to pSEV, the menstrual cycle and GABA function, have been limited to interventional study designs. There is a need for exploration of pSEV and other temporal saccade measures across a natural (non-interventional) menstrual cycle, in association with symptoms of premenstrual distress.

Method

Six healthy women were observed over two menstrual cycles. Daily data was collected from them in relation to mood and physical symptoms. This data was collected using the Daily Record of Severity of Problems (DRSP). These women also completed two eye-tracking tasks, once in follicular phase and once in luteal phase. Differences in pSEV and latency were analysed by phase using Generalised Estimating Equations (GEE). GEE analysis was also run for phase changes in pSEV, with inclusion of covariates related to DRSP scores.

Results

This study found that in neutral saccade tasks, there was a significant decrease of pSEV in luteal phase compared to follicular phase. Significance of phase difference was found both with and without adjustment for covariate effect of DRSP scores. Emotional saccade tasks did not have significant phase differences. Latency did not show significant phase differences.

Conclusions

This study found a downwards change in luteal phase pSEV compared to follicular phase. This study is the first of its design. Whilst it has a very small sample size, it has some preliminary findings indicating a potential relationship between menstrual cycle phase, pSEV and consequently the GABA pathway. It also investigates the link between these physiological changes and psychological symptoms, through analysis of pSEV with DRSP scores. This study prompts further exploration of the role of GABA in premenstrual distress with the use of pSEV. Ultimately, this study hopes to feed into a better understanding of premenstrual distress and subsequently better treatment options for women with PMS/PMDD.

Adelaide Grenfell

SNOTWATCH – Asthma

Supervisor Names and Institute Affiliations:

Jim Buttery – Professor of Paediatric Epidemiology. Departments of Epidemiology and Preventative Medicine & Paediatrics, School of Public Health and Preventative Medicine & School of Clinical Sciences, Monash University; Infection and Immunity, Monash Children's Hospital; Monash Immunisation, Monash Health; Murdoch Children's Research Institute; Richie Centre, Hudson Institute; Clayton Victoria

Allen Cheng – Director of Infection Prevention and Healthcare epidemiology, Professor in Infectious Disease Epidemiology, Alfred Health; School of Public Health and Preventative Medicine, Monash University;

My BMedSc(Hons) year has been such an experience. SNOTWATCH-Asthma was an interesting topic from the get go and as someone who has an interest in paediatrics, it was the perfect topic for me. Having completed my fourth-year exams, I naively thought that I was done with stress. How could a year long project be as stressful as my final exams? Long story short my year was relatively relaxed until four weeks until the thesis due date when I encountered data access issues. Whilst this last month was stressful,I it was also very enjoyable. This was due mostly to the support of my friends in the Department of Paediatrics. They fed mashed potato (my ultimate comfort food) and kept me company on late nights. With their help and support I completed my thesis! I will always be proud of the 11,500 words I wrote and of all the skills I learnt throughout the year.

ABSTRACT

Background

Asthma has a major health impact upon the paediatric population, with the disease's highest prevalence in children under the age of 14 years. Additionally, it places a significant burden on the healthcare system and the economy. Viruses are known triggers of the disease, yet little can be done to avoid a viral-induced exacerbation. The picornavirus species is thought to be the main viral family to cause viral-induced asthma. Technology has advanced enough to allow us to track viruses and to be able to predict asthma exacerbations should there be an association. However, can the numbers of viral detection be used to predict asthma exacerbations so clinicians and parents are aware as to when these attacks may occur?

Aims

We aimed to assess the relationship between common respiratory viruses and acute asthma exacerbations.

Method

Two de-identified data sets were obtained from Monash Health (MH). The first data set included data on all presentations to MH EDs between 2011 and 2017. The second data set contained all the positive respiratory Nucleic Acid Amplification Test (NAAT) results from 2011 to 2017. The data sets were combined using QLIK Sense Desktop, a business intelligence application. Time-series graphs were created, as were scatterplots between various respiratory pathogens and the number of acute asthma presentations in the study period. Correlation and cross-correlation was calculated to assess the relationship between respiratory viruses and asthma presentations, with a particular focus on picornavirus.

Results

Children aged 0-4 years made up the majority of our study population. They accounted for 57% of the acute asthma presentations and 82% of the children who underwent a NAAT in the time frame. During the study period, asthma presentations were approximately 3.5% of all ED presentations, and picornavirus was the most detected virus. Asthma was seen to be seasonal with peaks occurring in February and November, correlating with the back to school period and high allergen period, respectively. Picornavirus was endemic throughout the year, and followed no particular seasonal trend. Picornavirus and asthma exacerbations were found to be weakly positively correlated, with a coefficient of determination of 0.3. Cross-correlation also found weak correlations between the peaks of virus detection and acute asthma presentations. We also noted an annual February peak in asthma presentations.

Conclusions

SNOTWATCH – Asthma is the first study looking at the relationship between picornavirus and acute asthma presentations on a population level. The correlation between acute asthma attacks and picornavirus were weak. Even though we can track viruses, we cannot use an increase in numbers of viral detections to predict asthma exacerbations. Clinician and community education may reduce the annual February peak by encouraging the use of preventative medicine over the summer months. Whilst we can track snot, we can't use it to predict asthma exacerbations

Olivia Grimwade

Attitudes towards payment and payment practices in human infection studies

Supervisor Names and Institute Affiliations:
Justin Oakley (Monash Uni)
Julian Savulescu and Alberto Giubiliani (Uni of Oxford)

I undertook my BMedSc(Hons) at the Oxford Uehiro Centre for Practical Ethics following my fourth year of med. I've always had an interest in bioethics and there's nothing I love more then having a heated discussion about a spicy topic, so that prompted me to apply for the Oxford Bioethics program. Living in Oxford was an incredible opportunity and the social, sporting and academic scene was unlike anything I've ever experienced. I really enjoyed meeting incredible people from around the world, attending philosophy lectures, ethics conferences and getting involved in Trinity College, the Oxford AFL team and the light weight boat club. I found my research really stimulating and interesting although challenging, especially as I had never studied any formal philosophy or ethics in the past. The self-directed format of the year allowed me to take time to become familiar with the ethical theory and pursue other areas of interest such as public policy. I really appreciate the introduction I was given to bioethics through this program and my incredible supervisors.

I cannot recommend it highly enough and I would be happy to speak to anyone who is interested in the program

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ABSTRACT

Background

Human Infection Studies (HIS) are research trials involving the infection of otherwise healthy participants with disease. HIS are critical tools employed in medical research to study the causation of disease, incubation, symptomology and importantly, to progress vaccine development. There has been much debate surrounding the broader range of ethical issues that HIS provoke, namely, informed consent and the acceptable levels of risk in human research. However, the payment of HIS research participants is a problematic issue that, despite generating public debate, has been less discussed in current ethical and medical literature.

Aims

This project will integrate empirical data with ethical analysis. There are two primary aims. The first aim is to collect empirical data that assesses the attitudes between the public and HIS investigators towards payment in HIS, and the specific payment practices and principles in HIS. The second aim is to perform an ethical analysis of my empirical data and to suggest a framework that outlines how to devise ethically justifiable payment of HIS participants.

Method

An online survey of a representative sample of the UK public was undertaken. The survey comprised of both hypothetical vignettes and direct attitudinal questions which assessed respondents' opinions on the explicit payment for risk in HIS, various payment models and the concerns of payments being coercive or an undue inducement to HIS participants. The prominent philosophical stances to the ethical issues raised by payment of HIS participants were identified through the literature review and then were carefully considered and compared to my empirical data through the process of reflective equilibrium.

Results

The survey collected 264 valid responses. Overall respondents believed HIS participants should be paid significant amounts of money for undertaking HIS trials and that the risk involved in the trial should be explicitly accounted for in the payment. The vast majority (86.7%) of respondents ranked risk as the most important factor to consider in determining payment for HIS. Many respondents somewhat agreed that high payments could potentially pose risks of undue inducement (71.6%) and coercion to potential participants (57.2%). However, when considering the hypothetical scenarios, the actual concern surrounding these issues did not seem considerable and it did not lead to respondents limiting the payment offered to HIS participants The ethical analysis identified and explored several payment factors that are supported both by normative claims and our empirical data and should be considered by HIS investigators when determining just payment for HIS participants. These payment factors included the time requirements, the study location, pain experienced and risk.

Conclusions

This thesis argues that payment for risk encountered by HIS participants is ethically justifiable. Furthermore, it supports the claims that the concerns of coercion and undue inducement are not sound reasons for limiting payment in HIS but are instead wrongly preventing the fair compensation of HIS participants. Ultimately, I argue that a Wage and Risk Payment Model that considers a number of different payment factors is the best model to deliver just payment to HIS participants.

Amy Hatton

The effect of in-utero psychotropic exposure on childhood development in four to ten-year olds.

Supervisor Names and Institute Affiliations:
Professor Jayashri Kulkarni
Monash Alfred Psychiatry Research Centre (MAPrc)
Central Clinical School (CCS)

I chose to complete a BMedSc(Hons) this year after completing 4th year in 2018, as I wanted further knowledge about the field of research, and I wanted to get a taste for what working as a clinician scientist might be like. What I have learned this year is that research is harder than you might first believe, I've learnt a lot about people and about research. I am more than happy to be contacted by anybody who is interested in completing a BMedSc(Hons) in the future.

ABSTRACT

Background

Clinicians and women need reliable evidence to balance the needs of both mother and baby with respect to using psychotropics in pregnancy. The rising prevalence of antipsychotic and antidepressant use in pregnancy makes obtaining this evidence a global health priority, particularly in terms of the longer-term impact on childhood neurodevelopment, which has not been studied in-depth. It has been hypothesised that prenatal exposure to serotonin and dopamine systems, upon which many psychotropic medications act, may have implications on the neurodevelopment of children. Given the significant burden of disease associated with developmental delay or disability, it is necessary to identify whether maternal psychotropic use during pregnancy, is an independent risk factor. If so, more tailored management and follow up of these children may be warranted, allowing for early detection and intervention.

Method

This is a prospective observational cohort study that was designed to investigate whether children exposed in-utero to antipsychotic medications, display any developmental deficits in comparison to unexposed children. Our cohort was recruited from the National Register of Antipsychotic Medication in Pregnancy (NRAMP) and included children exposed to antipsychotic medication (n=26) and as well as those unexposed (n=5). All children were exposed to maternal mental illness. Data were collected in a single ZOOM video interview, with both mother and child. The Parental Evaluation of Developmental Status (PEDS), a parental screening questionnaire was used to assess the development of children across 10 developmental domains. Statistical analysis was completed using the G-Formula macro to simulate our dataset to n=100,000 hypothetical cohorts, producing population-based estimates of risk.

Results

In four to 10-year-olds exposed to antipsychotics in-utero, there is an increased risk of developmental concern, when compared to an unexposed group across all developmental domains (bar school progress). For antidepressant medication there is a weak trend towards increased concern across all developmental domains. Exposure to both medication classes increases the risk above independent medication exposure.The two most important findings from this study are the increased risk of socio-emotional developmental concerns (RR 1.19 (95% CI (1.03-1.47))), and behavioural concerns (RR 1.14 (95% CI (1.01-1.38))) in children exposed to antipsychotics compared to the unexposed population. These results may be correlated to an increased risk of neurobehavioural disorders such as Autism Spectrum Disorder (ASD) in antipsychotic exposed children.

Conclusions

This study is an important contribution to the current literature in our unique group of women and children. This result suggests there may be an independent link between antipsychotic and antidepressant exposure and neurodevelopment deficits in school aged children. This suggests that increased developmental surveillance using standardised developmental assessments may be necessary in our cohort of children, particularly in those exposed to antipsychotic medications.

Abi Aufar Hawali

Effect of Western Diet from early life on cognitive performance in rat model of old age

Supervisor Names and Institute Affiliations:
Supervisor: Prof. Helena C. Parkington & Dr. Harry A. Coleman
Department of Physiology Monash University Clayton, Victoria

This year has been one of the most fruitful and educational year in my li fe so far. It was a great honour and a privilege to be able to undergo the BMedSc(Hons). I am a 3rd year medical student and I came to Melbourne with no experience in animal studies nor wet labs, and to be honest it was very challenging year, and I had trouble adjusting to the new environment at first and floundered a bit during the beginning but by the end of my Honours year I gained many skills and grew as person. Starting from animal work with mice, including handling, treatment as well as preforming minor surgery and blood and brain slicing and fixing. The electrophysiology was challenging and confusing at first but with the support of my supervisors, I manage to perform well. My overall writing, presentation, and talking skill improved by leaps and bounds compared when I started. The most important thing is communication between you and the staff as well as your supervisor and don't be afraid get help when you're stuck. Continue to preserve and to never give up is the key to success as well maintaining communication.

ABSTRACT

Background

Dementia, diabetes, and obesity are some of the diseases that have increased in recent years worldwide. Western diet (WD) predisposes to obesity and/or diabetes and this leads to prolonged, low-grade inflammation, and inflammatory cytokine expression correlates with obesity. Many studies have interrogated the role of obesity in mid or later life on cognitive dysfunction or dementia onset in human populations and in rodent models, with very variable results. The curre nt obesity epidemic has seen the development of obesity in the very young (pre puberty). It is likely that offspring raised in these conditions would likely remain overweight or obese throughout their lives. We hypothesize that obesity from early in life leads to enhanced cognitive dysfunction in old age, using a rat model.

Method

Rat dams were fed a Western diet (WD, high in fat and sugar) or control chow (CC) before and throughout pregnancy and lactation. The offspring were maintained on the diet of their dam until study at 2 years of age. Body composition and metabolic status were determined using DEXA and a glucose tolerance test, respectively. Anxiety was tested using an elevated plus maze (EPM). Cognitive function, reference and working memory, was tested in a radial 8-arm maze (RAM). Eight weeks following these tests, hippocampal slices (300μm thick) were prepared for electrophysiology and tissue fixed for later immunohistochemistry (IHC). Electrophysiological studies included longterm potentiation (LTP), bursting activity, and synaptic function.

Results

Long term exposure to WD in rats, compared with CC controls, resulted in an increase in body fat mass and slow glucose disposal, which serve as markers of obesity. WD animals spent more time in the closed arms of the EPM, suggesting greater anxiety. Compared with their CC counterparts, WD rats displayed cognitive and memory dysfunction as indicated by slower learning ability, reference memory. WD rats were especially impaired in relation to using previous experiences, a marker of working memory dysfunction. Synaptic dysfunction, such as reduced hippocampal LTP as well as hippocampal hypo-activity was greater in WD, compared with CC rats. IHC revealed an increase in activated astrocytes in tissue from WD rats versus CC controls. The area of calmodulin kinase II, an indicator excitatory glutamatergic neurons, in WD hippocampal CA1 and CA3 areas was reduced to about a third of that in CC hippocampus. IHC staining for GABA and somatostatin was highly abnormal in both CC and WD hippocampi.

Conclusions

These rats had been tested in RAM at 10-12 weeks of age, and this re-testing at 2 years revealed that aging was associated with reduced learning capacity, and this was not unexpected. However, animals on lifelong WD displayed greater dysfunction, compared with their CC counterparts, especially for working memory. The mechanisms underpinning this cognitive impairment were indicated in terms of synaptic dysfunction in the hippocampus, the centre of memory and learning, revealed by poor long-term potentiation and hypo-activity. This was confirmed by a 3-fold reduction in the major excitatory neurons and an all-but-absence of inhibitory neurons. A role for neuro-inflammation was indicated, in terms of greater activation of astrocytes in WD hippocampus. This model elucidates the poor memory performance, also observed in humans with well-established dementia.

Irsa Gagah Himantoko

Outcomes of Major Revisional Bariatric Surgical Procedures

Supervisor Names and Institute Affiliations:
Main Supervisor : Mr Paul Burton, MBBS (Hons), FRACS, PhD
Co-Supervisor : Professor Wendy Brown, MBBS(Hons), FRACS, FACS, PhD
Institute : Department of Surgery, Central Clinical School

Hi, I'm Irsa, a fourth-year medical student from Universitas Indonesia. I completed honours at one of the leading centres in bariatric surgery, and it was a very valuable experience for me. This year was fun and challenging at the same time. I was so lucky to be surrounded by amazing and great people in their field. These surgeons, nurses, and the staff of department of surgery were really supportive and helpful throughout the entire program. The best thing about having honours in the department of surgery was the chance to observe bariatric surgeries directly from the operating theatre. Honours year at Monash University was one of the best years of my life.

ABSTRACT

Background

The number of bariatric procedures increases significantly, along with the number of revisional procedures. Biliopancreatic diversion (BPD) and biliopancreatic diversion with duodenal switch (BPD/DS) are options for patients who had failed to achieve or maintain considerable weight loss from the previous surgery. Hence, the use of these malabsorptive procedures in the revisional setting is more common nowadays. Consequently, the number of patients who are at risk of nutritional complications have also escalated. Lifelong adherence to the dietary guideline and routine follow up are crucial to monitor and evade this complication. Some of them, however, are lost to the follow-up. These patients might be at risk of serious insidious complications. To date, no study has demonstrated the long-term consequences of these procedures. Therefore, this study aims to determine the long-term sequelae of revisional BPD and BPD/DS and the compliance to follow-up.

Method

We conducted a retrospective review of the long-term effects of BPD ± DS in revisional setting. All patients who had BPD ± DS as a revisional bariatric surgery in Cabrini and Alfred Hospital from 2002-2018 were included in this study. Information was extracted from several electronic databases used in both clinical sites including Lap base, Power Chart, and Genie.

Results

A total of 102 patients who undergone revisional BPD ± DS in Alfred and Cabrini Hospital were identified from the databases (2002 - 2018). In this study, we showed that revisional BPD ± DS could effectively achieve substantial excess weight loss (65.8%) at 2 years post-surgery and sustained (64.2%) at 11 years of post-surgery. This resulted in improvements of obesity-related comorbidities such as diabetes and hypercholesterolemia in at least 87% and 86% of patients, respectively. Moreover, the operations have no intra-operative complication, an acceptable rate of early post-operative complication (15.7%) and no long-term life-threatening complication. However, there were high prevalence of nutritional deficiencies, especially in vitamin D (64.7%) and iron (73.5%), a significant rate of reoperation (41.2%) and the maintenance of follow up was poor (22.5% of patients lost to follow up).

Conclusions

Overall, revisional BPD ± DS has an acceptable rate of perioperative complications. It is an effective procedure for weight loss and comorbidities remission. However, special attention needs to be given to ensure adequate follow up to monitor nutritional deficiencies and long-term complications.

Florence Ho

The role of NOX5 in vascular disease

Supervisor Names and Institute Affiliations:
Prof Karin Jandeleit-Dahm, Dr Anna Watson
Department of Diabetes, Central Clinical School, Monash University

I decided to intermit from my medical studies after Year 4C to undertake a BMedSc(Hons). This was for a variety of reasons – to learn about the world of research, to develop my critical thinking and presentation skills, and to experience a more self-directed year. The project I undertook was a lab-based project on atherosclerosis in diabetes. My choice of project came down to two factors – my trust in the supervisors and team, as well as an interest in the fields of cardiology and endocrinology. My advice to future students would be that the people you will be working are crucial in determining the experience you have. I was fortunate to have very supportive supervisors, who were experienced with Honours students and had similar expectations to me for the year.

Please feel free to contact me with questions about my project, undertaking a lab-based BMedSc(Hons) or the general BMedSc(Hons) experience, at **hoflorence41@gmail.com**

ABSTRACT

Background

Atherosclerosis is a devastating complication of diabetes, which can lead to clinical events such as myocardial infarction, stroke, and peripheral vascular disease. Current management is not sufficient to reduce the significant morbidity and mortality which reflect the burden of these complications. Understanding the mechanisms which may contribute to these macrovascular complications could therefore yield important insights into potential therapeutic targets.
There is now increasing evidence that oxidative stress plays a critical role in the complications of diabetes, including kidney disease and retinopathy. NADPH oxidase (NOX) enzymes are upregulated in diabetes and have the sole purpose of generating reactive oxygen species. Excessive reactive oxygen species can lead to oxidative stress, which can then increase atherosclerotic plaque development.
There are several individual NOX isoforms found in vascular cells – NOX1, NOX2 and NOX4. Each isoform plays a unique role in vascular and immune disease. Due to NOX5, another vascular isoform, not being expressed in rodents, there remains a paucity of knowledge on the role of NOX5 in the vascular complications of diabetes.

Aims

This study aimed to determine the role of endothelial NOX5 in both the early and advanced stages of atherosclerotic plaque development in diabetes, in an in vivo mouse model.

Method

Two mouse models were used in this study, with NOX5 expression under the control of either the Tie2 or the VEcad promoter, allowing endothelial-specific expression of NOX5. VEcad/NOX5+/ApoE$^{-/-}$ mice were generated through crossbreeding of transgenic strains and were run to 10 weeks of study. Tie2/NOX5+/ApoE$^{-/-}$ mice were generated with targeted knock-in of the NOX5β gene with the Tie2 promoter and were run to both 10 and 20 weeks of study. Diabetes was induced with streptozotocin injections. At cull, blood and plasma were obtained for baseline metabolic parameters. Aortas were collected for plaque area analysis, gene expression quantification, plaque morphology and immunohistochemical analysis.

Results

Diabetes was associated with increased plaque area, as well as nitrotyrosine and inflammatory protein expression. Abdominal plaque area was significantly greater in diabetic Tie2/NOX5+/ApoE$^{-/-}$ mice compared with diabetic Tie2/NOX5-/ApoE$^{-/-}$ mice at the 20-week timepoint; however, these changes were not observed in the other parts of the aorta and when total plaque area was assessed. In addition, diabetic Tie2/NOX5+/ApoE$^{-/-}$ mice had lower fibronectin gene expression than diabetic Tie2/NOX5-/ApoE$^{-/-}$ mice at 10 weeks of study. NOX5 expression did not affect markers of plaque instability or inflammation expression at either the gene or protein level.

Conclusions

In the setting of diabetes, NOX5 may play a pro-atherogenic role specifically in the abdominal aorta and could be implicated in fibrosis and remodelling of the vasculature. However, it does not appear to play a major role in atherosclerotic disease in other parts of the aorta at our timepoints in this study.

Kelly Hotchin

The frequency, preventability and consequence of adverse events in the paediatric intensive care unit

Supervisor Names and Institute Affiliations:
Supervisors: Associate Professor David Brewster[1], Professor Warwick Butt[1,2]
Departments:
1. Central Clinical School, Monash University
2. Paediatric Intensive Care Unit, Royal Children's Hospital

After completing my fourth year of medical school in 2018 I felt as if a break from clinical placement and a year to learn different skills would fit in well after a large year of study. The BMedSc(Hons) year provided me with an opportunity to immerse myself in the world of research and become more involved in extracurricular activities. My BMedSc(Hons) year was based at the Royal Children's Hospital in the Paediatric Intensive Care Unit and comprised of a balance of both research and clinical exposure. I chose to undertake my year at RCH as I am interested in paediatrics, and I found the safety and quality aspect of my project provided an opportunity to assess and/or improve the healthcare provided to patients. This year allowed me to gain skills not only important for research, but important for any medical career. I have thoroughly enjoyed this year and the opportunities that have come with it. I look forward to continuing to incorporate research into my future medical career.

ABSTRACT

Background

Patients admitted to a paediatric intensive care unit (PICU) are at risk of experiencing an adverse event as a result of the healthcare they are receiving. Due to their severity of illness and the intensive nature of their care, adverse events may result in major harm. High rates of adverse events have been shown to be preventable. The accuracy of current adverse event recording methods in Australian PICU's has not been determined, and thus there is uncertainty as to the true rate of adverse events occurring to these patients.

Aims

1. To determine the true incidence, preventability and consequence of adverse events in the PICU at the Royal Children's Hospital, Melbourne.

2. To compare a prospective observational method with both an existing clinical patient database and a state-wide voluntary reporting system.

Method

A prospective observational cohort study was performed from March to June 2019 in the PICU at the Royal Children's Hospital, Melbourne, with ethics approval. Prospective observation was used by one data collector over the three-month study period to collect adverse events occurring in 300 consecutive patient admissions. Following the data collection, the individual data collector along with a panel of three PICU consultants graded each event to determine the nature of the event, along with the preventability and harm caused. Relevant definitions were provided at the commencement of the study period. This data was then compared with an existing PICU clinical database and the Victorian Health Incident Management System (VHIMS) from the same time period.

Results

A total of 534 individual adverse events were identified during the study period. These adverse events occurred in 53.00% of patient admissions (n = 159). There were 39.50 adverse events per 100 patient days. Preventable adverse events occurred in 90.07% of events, with 99.44% of all events resulting in minor harm.
The prospective data collection method used in this study was superior to both the current PICU database and the VHIMS in collecting adverse events.

Conclusions

Adverse events are common in the ICU, with the majority of these being preventable. The current recording methods used internally and by the state government are less efficacious than prospective observation. It is clear that there is great room for improvement of the quality and safety of patients in PICUs. Targeted preventative strategies can now be developed in this PICU as areas of need have been identified. Other institutions can apply the same method of adverse event detection to determine areas of potential quality improvement.

Elena Jensen-Marini

Exploring patient reported quality of life in lung cancer patients: a qualitative study

Supervisor Names and Institute Affiliations:
Dr Darshini Ayton (School of Public Health and Preventive Medicine)
A/Prof Robert Stirling (Alfred Hospital)

I had completed fourth year medicine when I started my BMedSc(Hons). I chose to do it because I had very little research experience, I had heard from other BMedSc(Hons) students they enjoyed it and to take a year to explore a more specific aspect of medicine.
I chose my project because I wanted to have patient interaction and therefore was excited by the idea of doing a qualitative project made up of patient interviews. I also chose it because this project had supervisors who were very supportive from the start and because I was interested in the experience of cancer patients, specifically lung cancer with its high symptom burden and poor prognosis. I have really enjoyed this year. I knew very little about qualitative research so have really enjoyed learning about it. Because we have less teaching about qualitative methods I benefitted from having a supervisor who was an expert in this area. I got to know a lot of really helpful staff at the Alfred, as well as 14 patients who kindly dedicated their time to making the project possible.

I am happy to be contacted by anyone considering doing a BMedSc(Hons) on:
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ABSTRACT

Background

In Australia lung cancer is the leading cause of cancer-related death. Lung cancer has a poor prognosis, severe symptoms and treatment side effects, all of which can significantly impact quality of life. Patient-reported outcome measures (PROMs) have been shown to be effective methods of collecting patient quality of life data. The Victorian Lung Cancer Registry (VLCR) is planning to implement regular collection of quality of life data with the use of a lung cancer specific PROM. Currently there are four lung cancer PROMs, however they have not involved patients in their development which may impact on their relevance. The aim of this study is to determine if there is a PROM appropriate for use within the VLCR or if a new one needs to be developed informed by interviews with lung cancer patients to explore factors most important to their quality of life and their opinion on existing PROMs.

Method

This qualitative study employed a phenomenology approach. Purposive sampling was used to recruit 14 lung cancer patients from the Alfred hospital and VLCR records. Semi-structured interviews were conducted with each patient. Each interview was audio recorded, transcribed and then managed with the program NVivo. Thematic analysis was used to identify and develop themes.

Results

Five themes were developed. The first theme captured patients attitudes towards lung cancer. Acceptance, positivity, the use of humour and determination were identified by patients as important as well as maintaining normality in life and remaining informed. The second theme was the need for lung cancer awareness. Patient's reported shock at their diagnosis, but also felt that society had preconceptions and stigma attached to lung cancer. Thirdly, the importance of relationships with family and friends was identified as a source of support but also had the potential for negative impact due to concern about family wellbeing. Fourth, the relationship with the treating team was emphasised as directly affecting patients quality of life through both positive and negative interactions. Finally, the value patients put on remaining independent, including maintaining autonomy, mobility and the ability for self-care strongly influenced patient opinion of their quality of life. Additionally, patients believed that completing PROMs was beneficial, however had problems with the formatting, content and relevance of the existing PROMs.

Conclusions

This study determined that patients would appreciate completing a PROM but that the existing lung cancer PROMs are not able to identify the themes most important to lung cancer patients quality of life. A new PROM needs to be developed, influenced heavily by the five themes patients report being most important in order to collect accurate quality of life data for the VLCR.

Alice Yue Jiang

Thiamine administration in enterally-fed, critically ill patients with hypophosphataemia.

Supervisor Names and Institute Affiliations:

Associate Professor Adam Deane:

- Intensive Care Unit, Royal Melbourne Hospital
- Department of Medicine and Radiology, University of Melbourne

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Professor Rinaldo Bellomo:

- School of Public Health and Preventive Medicine, Monash University
- Intensive Care Unit, Royal Melbourne Hospital
- Department of Medicine and Radiology, University of Melbourne

I did a BMedSc(Hons) after completing fourth year. Despite learning all about the importance of evidence-based medicine, I had little idea of what was involved in generating this 'evidence'. I wanted to explore and become fully immersed in the research world. Hoping to gain experience in clinical research, I took on a trial looking at the physiological effects of Vitamin B1 in ICU patients. I was aware of the risks that came with undertaking a prospective study, but with the support of my supervisors, I was determined to take on the challenge.
This year has been chaotic, with obstacles arising at the most unpredictable times, but these were all invaluable opportunities for me to develop important skills such as problem-solving and independent thinking. Having had the privilege of overseeing the project from the very beginning, I have learnt a great deal about the processes and intricacies behind conducting clinical trials. A clinical trial for a BMedSc(Hons) project is tough, but also incredibly rewarding!

If you have any questions at all, feel free to contact me: **ayjia3@student.monash.edu**

ABSTRACT

Background

Enteral nutrition is an essential component of supportive care during critical illness. Enteral nutrition formulas contain a substantial amount of carbohydrates. Thiamine and phosphate are essential for carbohydrate metabolism. During critical illness, there is an increased requirement for thiamine, which is exacerbated in patients receiving enteral nutrition. Relative thiamine deficiency and the subsequent alteration of carbohydrate metabolism may increase blood lactate concentrations. Elevated blood lactate concentrations are strongly associated with poor outcomes. There are no clinical tests to diagnose thiamine deficiency, but enterally-fed patients who develop hypophosphataemia may be at high risk. There have been no studies in this population evaluating the effects of pharmacological thiamine administration.

Aims

The primary aim was to determine whether thiamine administration (200 mg intravenous twice daily, IV BD), compared to standard care, reduces blood lactate concentrations in critically ill, enterally-fed patients with hypophosphataemia. There were a number of secondary objectives, including biochemical and feasibility aims.

Method

A prospective, open-label, parallel group, randomised clinical trial was conducted in critically ill adult patients who developed hypophosphataemia (<0.65 mmol/L) within 72 hours of commencing enteral nutrition. Patients were randomised to receive thiamine (200 mg IV twice per day, up to 7 days) or standard care (standard enteral nutrition which contains a small amount of thiamine but no IV administration). Blood lactate was measured 6-hourly. Patient demographics, clinical interventions, daily laboratory results and outcome data (censored at 90 days) were recorded. Blood and urine samples were obtained from study participants on study day 1 and 3 for analysis of thiamine pyrophosphate concentrations, via liquid chromatography mass spectrometry.

Results

Between 13 March and 1 September 2019, 37 patients participated and contributed to this interim analysis. Eighteen participants were allocated to thiamine supplementation and 19 allocated to usual care. The demographics of participants were similar at baseline. There was no significant difference in the primary outcome of blood lactate concentrations over time between the thiamine and control group (-0.06 (95% CI: -0.30 to 0.18) mmol/L, p = 0.62). Blood samples of 17 patients were analysed, with 35% found to be thiamine-deficient at baseline. The intervention group had significantly higher whole blood thiamine pyrophosphate concentrations when measured on study day 3 pre-thiamine dose when compared to usual care (median [IQR] 203 mmol/L [180, 242] versus 82 mmol/L [71, 102], p = 0.004). There was an inverse association between serum phosphate concentrations and baseline thiamine concentrations (r2 = 0.47; p = 0.002). The trial met feasibility criteria. There were no differences in all other biochemical and patient-centred outcomes.

Conclusions

This trial, when complete, will be the first to evaluate pharmacological thiamine supplementation in enterally-fed, critically ill patients with hypophosphataemia. This preliminary analysis, whilst underpowered, suggests that administration of thiamine does not substantially reduce blood lactate, hypophosphataemia during enteral nutrition may be a poor surrogate marker for thiamine deficiency and IV thiamine administration substantially increases blood thiamine pyrophosphate concentrations and this augmentation is sustained.

Hirannya Karunadasa

Intestinal Ultrasound in Advanced Liver Disease

Supervisor Names and Institute Affiliations:
A/Prof William Kemp, Alfred Hospital, Department of Gastroenterology and Hepatology
Dr Siddharth Sood, Royal Melbourne Hospital, Department of Gastroenterology and Hepatology
Dr Britt Christensen, Royal Melbourne Hospital, Department of Gastroenterology and Hepatology

I chose to undertake a Bachelor of Medical Science after completing my fourth year of medicine. I was previously unfamiliar with research and this year provided an amazing opportunity to explore an area of interest and dive into the world of clinical research. I conducted my research in the gastroenterology department at the Royal Melbourne Hospital. Working in this department provided many opportunities to learn and develop a broad array of research skills, gain insight into how evidence is generated for clinical medicine and network with many amazing people. Overall, the BMedSc(Hons) year is a challenging yet deeply rewarding one. For those that are unsure how to get started with research or wanting a change of pace I would highly recommend undertaking a BMedSc(Hons) project. You never know what you might find!

Feel free to contact me at **hirannyakarunadasa@gmail.com** if you have any questions.

ABSTRACT

Background

Most of the morbidity and mortality in cirrhosis is related to the potentially life-threatening complications that develop in response to portal hypertension. Recognising patients at highest risk of complications provides an opportunity to improve outcomes. Current assessment of portal hypertension to prognosticate patients often requires invasive investigations which are significantly limited by their cost, invasiveness and accessibility. Existing non-invasive alternatives are valuable in identifying cirrhosis but are less useful in evaluating risk of clinical complications. As such, there is a need to improve non-invasive screening of cirrhotic patients.
Intestinal ultrasound has improved the ability to image the gastrointestinal tract at the bedside. As bowel wall thickening and reduced motility have been previously associated with cirrhosis, intestinal ultrasound may prove to be useful in prognosticating cirrhotic patients non-invasively. This use of intestinal ultrasound has not been previously explored in this population. We aimed to document the changes found on intestinal ultrasound assessment of the small bowel in cirrhotic patients, with a focus on small bowel wall thickness (SBWT) and peristaltic activity. Secondarily, we aimed to assess any association with the findings and markers of liver disease severity. Finally, we aimed to assess whether intestinal ultrasound could be used to predict the development of complications and changes to the severity of disease over a 12-month follow up.

Method

Patients with cirrhosis were recruited as part of an exploratory pilot study, at a tertiary institution between June and September 2019. Participants underwent intestinal ultrasound assessment of the small bowel with a focus on measuring SBWT and peristaltic activity. Thickness was measured at the terminal ileum and jejunum on axial and longitudinal views, while peristaltic activity was measured at the jejunum. EncephalApp Stroop testing, a questionnaire and medical file review were also completed. The cohort was stratified based on liver disease severity, presence of clinically significant portal hypertension (CSPH) and hypoalbuminemia. Statistical analyses comparing the stratified groups were used to assess for a significant difference between the groups.

Results

Twenty patients have completed their assessments, with 12 more awaiting scanning. The cohort consisted of 12 Child-Pugh A, 5 Child-Pugh B and 3 Child-Pugh C cirrhotics. All SBWT measurements taken in the terminal ileum on axial and longitudinal views were normal (<3mm), with median measurements 1.55mm (IQR:1.24-2.09) and 1.80mm (IQR:1.43-2.03) respectively. In the jejunum, 95% (19/20) of participants had normal SBWT, with median measurements of 1.75mm (IQR:1.53-2.13) on axial view and 1.63mm (IQR:1.33-1.88) on longitudinal view. There was no difference when groups were stratified according to disease severity, presence of CSPH or hypoalbuminemia. The median number of peristaltic waves was 3.5waves/minute (IQR:1-6), with no difference between stratified groups.

Conclusions

Intestinal ultrasound results were normal for nearly all cirrhotic participants recruited in the study, including those with the most severe liver disease. Despite potential clinical advantages, intestinal ultrasound assessment of the small bowel does not have utility in prognostication of cirrhosis. Our results challenge the current literature, that has likely overestimated the degree of SBWT based on retrospective CT analysis.

Ashan Kathriachchige

Outcomes of arteriovenous fistulae in renal transplantations

Supervisor Names and Institute Affiliations:
Mr Alan Saunder – Department of Surgery, School of Clinical Sciences, Monash University
A/Prof Willam Mulley – Department of Medicine, School of Clinical Sciences, Monash University

The BMedSc(Hons) year was certainly an interesting one. It was one with many ups and downs, and I learnt a lot – about research, about medicine, and about myself. I can say without a doubt, that if you do a BMedSc(Hons), you will take something valuable away from it – it may not be what you intended it to be, but it will be something nonetheless. I came into the year hoping to learn some research skills and dip my hand into the world of surgery, and while I did experience those things, I came out of it valuing more what I discovered about resilience, communication and time management. Overall, I have had some experiences I would never have had otherwise, and I will definitely approach the rest of my career in medicine with vastly greater perspective.

If you are interested in the BMedSc(Hons) program, I'd love to have a chat
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ABSTRACT

Background

End stage renal disease patients transition between haemodialysis and renal transplantation for renal replacement therapy. Vascular access, most commonly arteriovenous fistulae (AVF), is essential for haemodialysis but becomes redundant with transplantation. Maintaining an AVF can be advantageous if graft failure occurs, but can also harm patients, particularly the heart. There are no accepted guidelines on the management of persistent AVF in renal transplant patients. The latest research suggests AVF be routinely ligated to prevent and reverse cardiac sequalae.

Objectives

1) Identify prevalence of patent AVF in renal transplant patients and understand patterns of ligation and thrombosis.

2) Determine proportion of patent AVF which are usable and/or have high flow rates.

3) Understand patient perceptions surrounding the management of persistent AVF.

Method

1) A medical record audit of patients who received a renal transplant at Monash Health between March 2012 and March 2017 was conducted. Patient demographics, details of transplantation and AVF outcomes were collected from patient records and registry data. Proportion percentages of AVF status (patent, ligated, thrombosed) were calculated. Median time to ligation was calculated and indications for ligation were described as proportions. Survival of AVF from thrombosis was analysed to form a Kaplan Meier curve.

2) Patients with patent AVF identified in the medical record audit underwent doppler ultrasonography. Flow rates were measured and stratified into low (<300ml/min), normal (300-2000ml/min) and high (>2000ml/min).

3) A survey was conducted on those recruited for AVF ultrasonography. 7 questions related to AVF symptomology and decision making were asked.

Results

1) 251 patients had a persistent AVF with a functioning graft. AVF status was identified: 56.6% patent, 19.9% ligated and 14.9% thrombosed (17.6% unknown). Cumulative survival of AVF after 4 years was 0.791. Median time from transplant to ligation was 27.6 months (IQR=18.2–32.0). The most common indication for ligation was aneurysm (40%).

2) 36 of 65 participants recruited completed AVF doppler ultrasound. Median follow up from transplantation was 65.4 months (IQR=45.6-74.8). The median flow rate was 1249.5 ml/min (IQR=825.75–1962.5). Flow rate groups included 3 (9.8%) low, 23 (67.6%) normal and 8 (23.5%) high flow participants.

3) 50 of 65 recruited completed the survey. 84% had asymptomatic AVF. 64% never considered having their fistula ligated. 20% wanted AVF ligation. 48% were unsure whose preference it was to keep the AVF. 74% believed the AVF was kept "Just in case". 34% had no understanding of AVF complications. 60% believed themselves to be the most important influencer in decisions related to the AVF.

Conclusions

The introduction of routine ligation would impact a significant proportion of the renal transplant population at Monash Health. Many patients have an AVF that is high risk for cardiac complications. Patient understanding around the advantages and disadvantages of keeping an AVF is lacking. There is a need for protocols relating to the management of AVF to be formulated, included optimisation of patient education. Further prospective studies are required to understand the evolution of AVF flow rates and their clinical impact.

Jessica Kemper

Using Individual Participant Data Meta-Analysis To Compare Mechanical And Pharmacological Methods Of Inducing Labour

Supervisor Names and Institute Affiliations:
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[2]Department of Obstetrics & Gynaecology, Monash Health, Melbourne, Australia

I chose to undertake a BMedSc(Hons) after completing Year 4C in 2018. Obstetrics and gynaecology is a specialty I am interested in pursuing, and this project seemed like the perfect opportunity to explore this field further, while also gaining valuable research skills and knowledge. My ability to critically analyse scientific literature, my understanding of statistics, and my time management and self-motivation skills have all greatly improved courtesy of this year. This project was my first venture into research. While it has been challenging at times, I have thoroughly enjoyed it and it has been far more rewarding than I could have imagined. It has provided me with a number of contacts and enabled me to continue participating in research projects in the future. It has definitely been worth the extra year of university, and I would highly recommend doing a BMedSc(Hons). I could not have asked for better supervisors for this year, and my sincere and heartfelt thanks go to my supervisors, Kirsten and Ben, for their constant support and guidance.

If anyone has any questions about completing a BMedSc(Hons), please feel free to email me at
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ABSTRACT

Background

Induction of labour is a common obstetric procedure which stimulates labour commencement. It is currently used in approximately one-third of pregnant women in Australia. Induction is indicated when the benefits of delivery outweigh the risks of continuing the pregnancy, either to mother or fetus. Cervical ripening describes the softening, effacement and dilation of the cervix, which is vital before the second stage of labour can commence. The methods for stimulating cervical ripening can be classified as mechanical or pharmacological. Foley catheters are the most common method of mechanical induction in Australia. They place a physical pressure on the cervix, which stimulates the release of local prostaglandins that act on the cervical tissue. Misoprostol, a synthetic prostaglandin E1 administered orally or vaginally, is the most common method of pharmacological induction globally. Its use in induction of labour in Australia is generally limited to cases of fetal death in utero and termination of pregnancy. Prostaglandins cause cervical ripening by softening the cervix and stimulating uterine contractions. We aimed to compare the safety and efficacy of Foley catheter and oral misoprostol for the induction of labour.

Method

We undertook this IPD meta-analysis at Monash Medical Centre. Potentially suitable clinical trials were identified from a Cochrane Review and various online databases. Randomised controlled trials published prior to 1 January 2019 and written in English comparing the use of Foley catheter to oral misoprostol for cervical ripening prior to labour induction in viable singleton gestations were eligible to contribute. The corresponding authors of eligible trials were subsequently invited to contribute their raw data for analysis. The primary outcomes for this meta-analysis pertained to the effectiveness and safety, from a perinatal and maternal perspective, of the method for labour induction. The three primary outcomes were a composite adverse perinatal outcome; composite adverse maternal outcome; and the rate of spontaneous vaginal births.

Results

This meta-analysis included three separate trials, resulting in a total of 2627 participants. Of that, 1310 women had been assigned to Foley catheter as the method of cervical ripening, and 1317 women to oral misoprostol. A composite adverse perinatal outcome occurred in 55 (4.20%) babies in the Foley catheter group versus 75 (5.69%) babies in the oral misoprostol group (risk ratio 0.73, 95% CI 0.52-1.03). A composite adverse maternal outcome occurred in 237 (18.09%) Foley catheter participants and in 217 (16.48%) oral misoprostol participants (risk ratio 1.09, 95% CI 0.93-1.28). The final primary outcome of spontaneous vaginal birth occurred in 854 (65.19%) Foley catheter participants and in 886 (67.27%) oral misoprostol participants (risk ratio 0.93, 95% CI 0.83-1.06).

Conclusions

Oral misoprostol and Foley catheter were similarly efficacious for stimulating cervical ripening. However, we are unable to conclusively state that both agents are equivalent with respect to causing adverse perinatal or maternal outcomes. The individual patient scenario and clinician preferences need to be considered before choosing either method for stimulating cervical ripening.

Arrabella King

Digital stethoscope technology to evaluate breath sounds in preterm neonates with respiratory distress syndrome

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I decided to do a BMedSc(Hons) after completing fourth year in 2018. I chose to do my project in neonatology as I was interested in paediatrics and obstetrics and gynaecology, and thought the project would give me exposure in both fields. This year has been really enjoyable and has provided me with a greater understanding of what medical research entails. I have learnt that prospective research is unpredictable and can be challenging at times. I feel I am now better equipped to deal with set backs and work under time constraints! I have been really lucky to work closely with the team at Monash Newborn this year and gain lots of clinical experience within the NICU. I would definitely recommend a BMedSc(Hons) in neonatology at Monash Children's Hospital for anyone who is interested in the future.

ABSTRACT

Background

Respiratory distress syndrome is a common condition affecting premature neonates. Characterised by surfactant deficiency and dysfunction, neonates with respiratory distress syndrome have increased alveolar surface tension, which leads to alveolar collapse and decreased lung aeration. Assessing lung aeration in neonates with respiratory distress syndrome assists in determining the severity of the disease and helps to guide and monitor treatment. Digital stethoscopes are novel tools and there is increasing evidence supporting the use of this technology in paediatric medicine. Digital stethoscope technology has yet to be used to evaluate lung aeration in neonates with respiratory distress syndrome.

Objectives

We aimed to determine whether digital stethoscope technology could be used to capture and analyse breath sounds in premature neonates on respiratory support. We aimed to determine if there were any differences in the acoustic characteristics of preterm neonatal breath sounds before and after surfactant replacement therapy, and between premature neonates who received surfactant replacement therapy and those who did not.

Method

We used the CliniCloud digital stethoscope to record the breath sounds of premature neonates. In neonates who received surfactant replacement therapy, we made one-minute recordings on the right side of the chest before and after surfactant administration, and between 24 to 48 hours of life. In neonates who did not receive surfactant replacement therapy we made a single recording between 24 to 48 hours of life in the same manner. We extracted the spectral characteristics from the recordings and compared them before and after surfactant replacement therapy, and between the two groups.

Results

We captured 103 recordings in 58 neonates within the recruitment period. We excluded 52 (50%) of recordings from the analysis due to sound interference, crying or insufficient breath sounds. We compared pre and post surfactant recordings in 9 premature neonates on respiratory support and identified no significant difference in the acoustic characteristics of breath sounds following the administration of surfactant. We included 33 neonates in the day 2 analysis and identified a significant increase in the total power, proportion of power in the high frequency (400 – 800Hz) range and standard deviation of the power spectrum in neonates who received surfactant.

Conclusions

It is currently not feasible to use digital stethoscopes to analyse breath sounds in preterm neonates on respiratory support due to technical reasons. There were no detectable differences noted in the acoustic characteristics of preterm neonatal breath sounds following surfactant administration. There were differences in the acoustic characteristics of breath sounds between neonates who received surfactant compared to those who did not, likely due to differences in infant size and mode of respiratory support.

Ashleigh Laird

Effects of a preoperative carbohydrate drink on postoperative recovery after day surgery in children: A randomised double-blind, placebo-controlled trial (The Sweet Dreams Trial)

Supervisor Names and Institute Affiliations:
Mr Maurizio Pacilli, Mr Ram Nataraja
Department of Paediatric Surgery, Monash Children's Hospital.
School of Clinical Sciences at Monash health, Monash University.

For my BMedSc(Hons) I had the privilege of working with the Department of Paediatric Surgery at Monash Children's Hospital. I have always been interested in research and paediatrics, having first started working with Maurizio at the start of my third year, and thus doing a BMedSc(Hons) was the next logical step. This year I was the trial coordinator for a RCT and was responsible for recruiting and investigating participants, data entry and analysis. Because of how much responsibility I was given I have been able to build upon my current research knowledge whilst also picking up new invaluable skills along the way.
My biggest piece of advice for a student conducting a clinical trial is not to be discouraged if nothing seems to be going right. An honours year is all about new experiences and learning new things, you will overcome issues faced and both you and your project will be better for it.
Maurizio and Ram are both incredibly supportive and love research so you will be given many more opportunities outside of your own honours project. I highly recommend this department if you're interested in paediatrics and/or surgery.

Please feel free to get in contact:
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ABSTRACT

Background

Postoperative nausea and vomiting (PONV) are common causes for a prolonged hospital admission in children undergoing day procedures. Overnight fasting leads to changes in the perioperative metabolic state and can amplify the surgical stress response, thus increasing the incidence of PONV. Preoperative carbohydrate (CHO) loading may attenuate the surgical stress response and allow for an improvement in postoperative recovery.
The aim of this study was to determine if the administration of a preoperative CHO drink would lead to a reduction in the incidence of PONV, pain, irritability and length of hospital stay (LOS) in children undergoing day procedures. Additionally, the aim was to investigate the perioperative metabolic state of those children receiving the CHO drink.

Method

This was a double-blind, placebo-controlled, randomised controlled trial (RCT) involving thirty-eight children aged four to sixteen years undergoing day procedures at Monash Children's Hospital. Patients were randomised to receive either the placebo or the CHO drink. At the induction of anaesthesia, the patient's blood glucose levels (BGL), blood ketones and venous blood gases (VBGs) were measured. Postoperatively, the incidence and severity of nausea, pain and irritability, and any episodes of vomiting were documented prior to discharge. Parent(s)/Guardian(s) completed a well-being questionnaire before discharge and 24 hours later to assess irritability. Incidence is presented as frequencies and percentages. The D'Agostino Pearson normality test was used to determine normality. The Students Unpaired T test and Mann-Whitney U Test were used to assess normally and non-normally distributed data, respectively. Parametric data is presented as mean ± standard deviation and non-parametric data is presented as median (range).

Preliminary Results

Recruitment for the trial is ongoing, 38 patients are analysed in this preliminary analysis – 19 in each group. Gender, age, weight and procedure type were similar between the groups. Incidence of nausea was similar between the groups with an overall incidence in Group A of 42.1% and in Group B 47.4% ($p>0.9$). The incidence of vomiting was equivalent in both groups, with 21.1% of patients vomiting in each group ($p>0.9$). In Group A the median LOS was 145 (102-275) minutes, and Group B was 165.5 (90-325) ($p=0.5$). There was a significant difference in irritability at 60 minutes postoperatively; 38.9% of Group A patients were irritable versus 0% in Group B ($p=0.01$). There were no significant differences in incidence or severity of pain, or metabolic state between the groups. No complications attributable to the administration of the CHO drink occurred during the study period.

Conclusions

In this preliminary analysis, there was no statistically significant difference demonstrated in any outcome between the two groups. However, the study is currently underpowered as the target number of patients is 120. Based on the current findings, the administration of a preoperative drink is feasible and does not increase the risk of complications. Additionally, continuation of the trial to reach the pre-defined power is deemed necessary to reveal any significant differences between the groups.

Jessica Le

Cognition, the menstrual cycle and premenstrual disorders

Supervisor Names and Institute Affiliations:
Dr Caroline Gurvich, Dr Natalie Thomas, Dr Elizabeth Thomas
Monash Alfred Psychiatric Centre (MAPrc) / Central Clinical School

Hi, my name is Jess and I did my BMedSc(Hons) this year after fourth year. I chose to do my project in women's mental health in the area of PMS and premenstrual dysphoric disorder (PMDD), as so much remains unknown about women's hormones, mood and mental health. Not only have I learnt a bunch of new research skills and worked one-on-one with lovely participants, I've also had the best time with an amazing group of students and work environment at the Monash Alfred Psychiatric Research Centre! This year taught me a lot about working independently and flexibly with my own personal timeline, because research can be unpredictable and things don't always happen the way you plan. Yet somehow, it ends up coming together and the process is really rewarding!

ABSTRACT

Background

Premenstrual disorders including premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) can have debilitating psychological impacts on women in the weeks before menstruation. These disorders are characterised by both mood and cognitive difficulties. Cognition has not been well-described in these conditions, and the current evidence is inconsistent. However, there is ample literature which suggests sex hormones, which fluctuate over the menstrual cycle, can have direct effects on cognition. Certain cognitive tasks, such as the Vandenberg-Kuse mental rotation test (MRT), have been suggested to be sensitive to sex hormones.

Aims

1. a) Compare performance (unadjusted) in the Vandenberg-Kuse mental rotation task (MRT) between the follicular and the luteal phase of the menstrual cycle

b) Compare performance in the Vandenberg-Kuse mental rotation task (MRT) between the follicular and the luteal phase of the menstrual cycle after adjusting for PMS/PMDD emotional, psychological and physical symptoms, as measured by the Daily Record of Severity of Problems (DRSP) questionnaire.

2. Compare performance in verbal memory, verbal fluency and executive function between the follicular and luteal phase, both unadjusted and adjusted for DRSP emotional, psychological and physical symptom domains

Method

Seven women (aged 21-33) tracked their mood, cognitive and physical symptoms over two consecutive menstrual cycles using the Daily Record of Severity of Problems Questionnaire (DRSP). Additionally, they attended three sessions – a screening assessment followed by two cognitive assessments in the follicular and luteal phase of the menstrual cycle. Cognitive performance was measured using the Vandenberg-Kuse MRT, the F-A-S Controlled Word Association Test for verbal fluency, a computerised battery (Cogstate) and the Delis-Kaplan Executive Function System (D-KEFS) Stroop Colour-Word Interference Test. Generalised Estimating Equation models were used to compare mean phase performance both unadjusted and adjusted for emotional, psychological and physical symptoms measured by the DRSP.

Results

The study found no differences in MRT performance between the follicular and luteal phase in this sample in both unadjusted and adjusted models. There was also no phase differences in verbal memory, verbal fluency, executive function and working memory. Nevertheless, there was a confounding effect of emotional, psychological and physical symptoms on cognitive performance in all cognitive tasks.

Conclusion

The results suggest that despite subjective impairments in PMS/PMDD symptoms in the luteal phase, there is no measurable cognitive impairment in the luteal phase using these cognitive tasks. Symptom severity may still impact performance overall, but these preliminary findings and cognitive domains require further study with a symptomatic PMS/PMDD and an asymptomatic control group.

Gillian Lim

The Physiology of Reflux Following Sleeve Gastrectomy

Supervisor Names and Institute Affiliations:
Professor Wendy Brown[1,2], Mr Paul Burton[1,2], Professor Geoff Hebbard[3]
1. Monash University Department of Surgery, Central Clinical School, Monash University, Melbourne, Australia
2. Oesophago-gastric Surgical Unit, Department of General Surgery, The Alfred Hospital, Melbourne, Australia
3. Department of Gastroenterology, Royal Melbourne Hospital, Melbourne, Australia

I decided to undertake a BMedSc(Hons) after finishing my fourth year of MBBS. Through the Department of Surgery at The Alfred, I was fortunate enough to be able to complete a project that combined my interests in surgery and physiology. This year has taught me valuable research skills, one of the most important being how to deal with the (many) challenges and mistakes that pop up during the research process. My advice for incoming students is to not be afraid to ask for help, but also to try and come up with solutions independently first.

I'm happy to answer any questions at **gslim3@student.monash.edu.**

ABSTRACT

Background

Sleeve gastrectomy (SG) is the most common bariatric procedure performed in Australia and worldwide. Although the surgery has been shown to produce durable weight loss outcomes and resolve most obesity-related comorbidities, gastroesophageal reflux disease (GORD) threatens the full uptake of the procedure among surgeons and patients. GORD in SG patients is associated with worsened quality of life, the potential need for lifelong medical treatment or reoperation, and a heightened risk of erosive oesophagitis and Barrett's oesophagus.
This project aims to determine the physiological basis of GORD following SG by establishing normative values in SG patients, understanding the link between symptoms and pathophysiology, defining reflux patterns in this cohort, and identifying candidate mechanisms that drive GORD in these patients.

Method

This study was divided into three arms. SG patients (n=111) were identified from a prospectively maintained database of bariatric surgery patients from The Alfred and The Avenue Hospital from April 2014 to May 2019. Oesophageal manometry, pH monitoring, and questionnaire data was also extracted from this database. For the first arm, these patients were stratified into asymptomatic, moderate symptoms, and severe symptoms according to standardised criteria. For the second arm, physiological variables from available investigations were tested to identify reflux patterns. In the third arm of the study, nine SG patients underwent extended, concurrent oesophageal manometry and pH monitoring.

Results

Normative values in the asymptomatic SG group and compared to a non-bariatric, non-GORD cohort: total acid exposure 3.85% (1.75-7.475) vs 1.6% (0.5-2.6), p<0.0001; erect acid exposure 4.3% (1.55-8.325) vs 1.5% (0.8-3.6), p<0.0001; supine acid exposure 1.4% (0-6.25) vs 0.1% (0-1.2), p<0.0001; and average duration of acid events 1.296 minutes (0.9536-2.162) vs 0.57 minutes (0.3-0.85), p<0.0001. Total acid exposure discriminated symptomatic reflux (AUC=0.703, p=0.002). Total acid exposure and events was increased in symptomatic patients (moderate: 7.5% (3.875-11.78), p=0.0147; 61.5 events (20.25-112.3), p=0.0105. Severe: 8.3% (4.6-16.75), p=0.0121; 63 events (32.5-93.5), p=0.0302). There was no significant difference in lower oesophageal sphincter basal tone or the incidence of abnormal peristalsis or hiatal hernias between the symptom groups.
Three reflux patterns were identified: baseline, irritant, and volume. The pathological patterns had significantly greater association with symptoms than the baseline pattern (OR=2.967, p=0.0235, 95%CI [1.186-7.36]).
Candidate mechanisms for reflux include increased intragastric pressure, diminished oesophageal response to refluxate, and isobaric pressurisation between components of the oesophagogastric junction (OGJ).

Conclusions

Normative manometric and pH values for SG patients have been defined. SG patients can be expected to have increased acid exposure and a longer duration of acid events than the normal population. Symptomatic GORD is characterised by heightened acidic states, however this is not determined by manometric parameters. Three novel reflux patterns in SG patients have been identified, with pathological patterns appearing more commonly and having a stronger association with symptoms. Given the altered anatomy and physiology involved with SG, singular physiological mechanisms relating to these alterations are driving GORD post-SG.

Sophie Lim

Evaluation of clonality in lentigo maligna

Supervisor Names and Institute Affiliations:
Professor Mark Shackleton (The Alfred Hospital, Melbourne)
Associate Professor Victoria Mar (The Alfred Hospital, Melbourne)

I decided to complete a BMedSc(Hons) after completing my fourth year in medicine. Research skills are becoming more and more essential for clinicians to have, so I wanted to get some experience while I could still afford to use the "I'm just a medical student" card. Melanoma is a pertinent public health issue and I enjoyed doing lab work, which is why my supervisors offered me this project. Although this was a lab-based project, I was still able to gain clinical experience through recruiting patients, and I got the opportunity to enter the amazing, mind-boggling world of bioinformatics. I also gained many non-academic skills during this year, which I didn't expect, including time management and interacting with different people. It wasn't always smooth sailing, but I was pleasantly surprised every time by how generous and willing people were at offering advice – so don't be afraid to seek help when you need!

I'm always happy to answer any questions so feel free to contact me at **sslim33@student.monash.edu.**

ABSTRACT

Background

Lentigo maligna (LM) is a type of in situ melanoma arising from chronic ultraviolet radiation (UVR) exposure. Although LM does not present a risk of metastasis, it is excised due to risk of progression into lentigo maligna melanoma (LMM), its invasive variant with metastatic potential. LMs have a high rate of local recurrence, with some patients requiring multiple surgeries. The mechanism of local recurrence has never been demonstrated. Recurrence can be redevelopment of an inadequately excised LM, or a new primary developing from a distinct melanocytic clone in the same anatomic region. The propensity for developing clonally distinct cancers in one region is called "field cancerisation", where adjacent cells are exposed to a carcinogen and undergo simultaneous malignant transformation. Appreciating the mechanism of local recurrence can guide management. This can be achieved by investigating the clonal relationship between incident LMs and their local recurrences. If recurrence arises from residual disease, the incident and recurrent LMs would be clonally related, thus adequate excision should prevent recurrence. If "recurrence" arises due to field cancerisation, the incident LM would be clonally unrelated to the recurrent LM. In such case, full excision of the incident lesion may never prevent recurrence and alternative topical treatments are required. Therefore, the primary objective of this study was to understand the clonal relationship between incident LMs and their local post-operative local recurrences. We also aimed to describe the molecular characteristics of LMs and LMMs, and identify distinguishing features of incident LMs that recur to invasive disease.

Method

Formalin-fixed paraffin-embedded (FFPE) sections of incident and recurrent LMs and LMMs were laser microdissected for DNA extraction. Tumour samples and their matched germline underwent whole exome sequencing using NextSeq500. Sequencing data was processed bioinformatically to identify somatic single nucleotide variants (SNVs), copy number alterations (CNAs) and clones within each sample.

Results

4 cases of recurrent LM and 3 cases of recurrent LMM were sequenced. All incident LMs were clonally related to their recurrences. LMs with invasive recurrence were more subclonal ($p = 0.11$) and carried mutant RTN1, which has not been previously described in the context of melanoma. LMs and LMMs carried the UVR signature and were better characterised by mutations commonly seen in melanomas arising from chronic sun exposure than those described in all cutaneous melanomas. Despite being early lesions, all LMs carried multiple CNAs, and the two cases with early recurrence were the only ones carrying CNAs associated with advanced disease and metastatic potential.

Conclusion

Data from this study suggests that local recurrence of LMs arises from residual disease. We have therefore confirmed that adequate excision margins are important in preventing recurrence. Clonality of LMs with invasive recurrence, role of mutant RTN1 in melanoma, presence of CNAs in LMs and association of early recurrence with high risk CNAs are worth exploring further over a larger cohort of samples and RNA sequencing. RNA sequencing can also help discern melanocyte and keratinocyte clones to enrich our understanding of LM clonality.

Sean Lim

Serum biomarkers (sFlt-1, PlGF, sEng) for the prediction of adverse outcomes in preeclampsia: a systematic review and meta-analysis

Supervisor Names and Institute Affiliations:
Professor Ben Willem Mol (Monash Health), Dr. Maya Reddy (Monash Health)

I chose to do a BMedSc(Hons) year initially for a two reasons: 1) To gain valuable insight into the skills and mindset of a researcher and 2) To 'take a year off' whilst being productive. From my experience I can firmly say that I was not able to have a relaxed year! The honours year is, contrary to popular belief, a tough year filled with thinking, inquisition and grit – with various high and low points of the year for all who decided to undertake it. Despite this, my experience this year has taught me a lot more than expected – I have gained a perspective I don't believe I would have if not for this year, and this knowledge will (I believe and hope) surely aid me in future clinical practice or research. If you are debating on whether or not to do a BMedSc(Hons) year, I strongly recommend it.

If you would like to discuss more about anything, please feel free to contact me via email: **stlim13@student.monash.edu**

ABSTRACT

Background

In recent years, there has been noticeable interest and publication in the literature regarding the utilisation of serum biomarkers such as soluble fms-like tyrosine kinase (sFlt-1) and placental growth factor (PlGF) as a means to predict preeclampsia and facilitate early management. However, preeclampsia remains difficult to accurately define as a disease process. In addition, presentations of disease vary immensely with a wide range of complications that may result. Various clinicians have adopted the usage of these biomarkers to manage patients with suspected or confirmed preeclampsia by using them for the risk stratification of patients and thereby influencing decisions on induction.

Method

A systematic search of MEDLINE, EMBASE, CINAHL, Cochrane, Scopus, and Emcare was performed to identify studies that analysed the usage of serum markers in pregnant women with preeclampsia and correlated their findings to the occurrence of adverse outcomes. Results regarding individual adverse outcomes were synthesised in a qualitative (systematic review) and quantitative (meta-analysis) assessment.

Results

In the 41 included studies, there was significant variation regarding patient population, immunoassay type, gestational age of sampling, adverse outcomes measured, and strategies employed to present findings (2x2 tables vs odds ratios vs mean/median values) – leading to high levels of heterogeneity. Despite this, results from the systematic review and meta-analysis demonstrate that PlGF, sFlt-1 and sEng have moderate to strong efficacies for prediction of adverse outcomes, with area under the curve values of 0.68-0.84. In particular, PlGF and the sFlt-1/PlGF ratio demonstrate the strongest evidence for their usage in clinical practice.

Conclusion

The current literature suggests that the usage of PlGF, sFlt-1 or sEng as a predictor of preeclampsia prognosis has strong potential. However, contrary to popular belief, current evidence is not sufficient to general clear conclusions due to a high level of heterogeneity and low number of articles between outcomes measured. Because of this, clinicians are encouraged to avoid the usage of PlGF, sFlt-1 or sEng to influence clinical decisions until further, more standardised results are achieved in the literature.

Stacey Lo

Effect of a Clinical Quality Improvement Bundle on Respiratory Outcomes in Very Preterm Infants: A Prospective Cohort Study

Supervisor Names and Institute Affiliations:
Dr Calum Roberts[1,2], Dr Risha Bhatia[1,2]
[1]Monash Newborn, Monash Children's Hospital.
[2]Department of Paediatrics, School of Clinical Sciences at Monash Health, Monash University.

Having completed 4th year in 2018, I wanted to take a break from clinical medicine, step out of my comfort zone and extend my perspective of medicine beyond individual patient care. The BMedSc(Hons) provided me with the perfect opportunity to gain expertise in an area of personal interest and formally develop research skills in a supportive environment. I chose a project in neonatal resuscitation – an area completely foreign to me but one which combined my interests in paediatrics and critical care. Eight months and 15,000 words later, I have absolutely no regrets. It has been a year of laughs and tears, late nights and sleep ins, challenges, growth and self-discovery. I have gained valuable clinical research skills and a greater appreciation of the challenges and applications of evidence-based medicine which underpins our everyday clinical decisions. A special shoutout to the staff and students at the Department of Paediatrics – this year wouldn't have been the same without your laughs, banter and Friyay Cakeday. I highly recommend undertaking a BMedSc(Hons) for any prospective students interested in research, seeking to learn new skills or simply wanting a 'different' year.

Don't hesitate to get in contact if you have any questions: **staceylocy@gmail.com**

ABSTRACT

Background

Bronchopulmonary dysplasia (BPD), defined as requirement for respiratory support or supplemental oxygen at 36 weeks' corrected gestation, is a major cause of neonatal morbidity. Exposure to mechanical ventilation (MV) is a significant risk factor for developing BPD in very preterm infants (VPTI). Our objective with this quality improvement (QI) project was to decrease rates of MV by implementing a respiratory bundle in VPTI born before 32 weeks' gestation.

Method

We identified key drivers on which to focus the QI strategy as optimising the transition to extra-uterine life and avoiding intubation unless truly necessary. We developed an evidence-based respiratory bundle consisting of delayed cord clamping (DCC), early bubble Continuous Positive Airway Pressure (bCPAP) in the delivery room and Minimally Invasive Surfactant Therapy (MIST) for implementation at Monash Children's Hospital during the 2018 calendar year. We compared respiratory outcomes and neonatal morbidity in a historical cohort of VPTI born in the immediate six-month period before the introduction of the respiratory bundle (pre-QI), with a prospective cohort born in the first six months after implementation of the bundle (post-QI). The primary outcome of interest was rate of MV during admission.

Results

87 and 98 infants were included in the pre-QI and post-QI cohorts respectively. We performed an adjusted analysis to account for the influence of gestational age, sex, antenatal steroids and differences in maternal gestational diabetes and antepartum haemorrhage. Infants in the post-QI cohort were less likely to require MV in the delivery room (adjusted odds ratio (aOR) 0.26, 95% CI 0.09-0.71, p=0.008), during the first 72 hours of life (aOR 0.27, 95% CI 0.11-0.62, p=0.002) and during admission (aOR 0.28, 95% CI 0.12-0.66, p=0.003). However, these differences were not observed in our subgroup analysis of infants born before 28 weeks' gestation. There were no significant differences in incidence of BPD (aOR 0.88, 95% CI 0.41-1.90, p=0.673) or combined BPD/death (aOR 0.93, 95% CI 0.44-1.96, p=0.838), however infants in the post-QI cohort had significantly lower BPD severity. The post-QI cohort were less likely to be discharged on home oxygen (aOR 0.22, 95% CI 0.05-0.88, p=0.033), had decreased incidence of pneumothorax (5.7% vs 0.0%, p=0.025), reduced age of first full enteral feed (13 vs 10 days, p=0.004), but had higher incidence of necrotising enterocolitis (aOR 14.00, 95% CI 1.36-143.90, p=0.026). Improved documentation of DCC and bCPAP were identified as areas for improvement in future QI cycles.

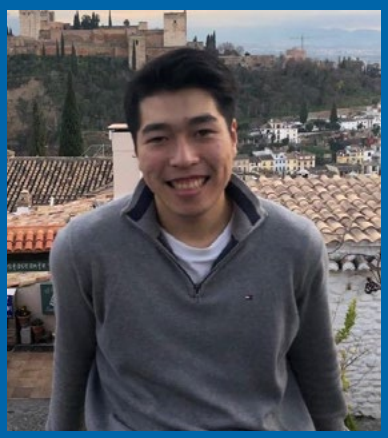
Conclusions

Implementation of a respiratory bundle consisting of DCC, early bCPAP and MIST were associated with significantly decreased rates of intubation in the delivery room, MV in the first 72 hours of life and during admission, and reduced the severity of BPD in VPTI. With the exception of increased incidence in necrotising enterocolitis, no adverse consequences were observed in the post-QI cohort. Ongoing monitoring of outcomes is required to ascertain long-term impacts of the respiratory bundle on BPD incidence. Further QI studies incorporating DCC and MIST would be of value to establish external validity of this respiratory bundle in other centres.

Patrick Lu

Venous Thromboembolism in Burns Patients: Are We Underestimating The Risk and Under-Dosing Our Prophylaxis?

Supervisor Names and Institute Affiliations:
A/Prof Heather Cleland, Director of Victorian Adult Burns Service, Alfred Hospital
Mr Cheng Lo, Plastic & Reconstructive surgeon, Alfred Hospital



I completed my BMedSc(Hons) after 4th year at the Alfred with the burns unit. I chose this project as I wanted to conduct a clinical study with a prospective element that allowed patient interaction. I experienced the difficulties of prospective patient recruitment and data collection first-hand. However, I also came to understand the importance of prospective studies and their potential to drive improvements in patient care. I had the opportunity to attend ward rounds, clinics and theatre lists throughout the year. I am very grateful for this experience and would like to thank all staff at the burns unit who not only supported my research project but made me feel very welcome and taught me so much. I would strongly encourage future students to consider doing a BMedSc(Hons) in a field they are interested in. You get a taste of research in a supported environment. It teaches you to be inquisitive, to be independent and how to research! I would like to sincerely thank my supervisors, A/Prof Heather Cleland and Mr Cheng Lo for all their support and mentorship throughout this year. They have made this year incredibly enjoyable and I would most definitely say this has been the best year of medical school.

If you have any questions, please feel free to contact me at **pylu1@student.monash.edu.**

ABSTRACT

Background

Venous thromboembolism (VTE) is a preventable complication among hospitalised burn patients that is associated with significant morbidity and mortality. Burns patients exhibit all factors of Virchow's triad and thus are at high theoretical risk of VTE. However, there is considerable heterogeneity regarding actual VTE incidence within the literature. There is also no current consensus on the best form of prophylaxis. At our institution, subcutaneous low molecular weight heparin in the form of enoxaparin sodium (Clexane©) is used at a daily dose of 40mg for thromboprophylaxis. Due to the unique metabolic changes in the acute phase of burn injury, the pharmacokinetics of Enoxaparin is altered and thus likely results in inadequate dosing.

Objectives

1. To determine the incidence and risk factors for VTE among burns patients at the Victorian Adult Burns Service

2. To determine the adequacy of the current enoxaparin thromboprophylaxis regimen at the VABS through measurement of anti-factor Xa (AFXa) levels and comparison with known reference ranges.

Method

Two observational cohort studies were conducted:
Study 1 was a registry – based study which reviewed cases of VTE in burns patients admitted to the VABS from 2013 – 2018. Data regarding clinical features, management and outcomes were collected on all eligible patients. This study was to serve as a pilot for Study 2. Study 2 was a prospective study which determined peak and trough AFXa levels in patients admitted to the VABS with > 10% TBSA burns. The initial peak AFXa level was measured four hours after the third dose of enoxaparin. The initial trough AFXa level was measured one hour prior to the fourth dose of enoxaparin. These levels were repeated every five to seven days.

Results

Study 1

1,475 patients were admitted to the VABS between 2013 – 2018. There were 20 cases of VTE (1.36%). Size of burn (OR = 1.04, 95% CI: 1.03 – 1.06, $p < 0.001$) and full thickness burns 12 (OR = 2.78, 95% CI: 1.15 – 6.73, $p = 0.023$) were associated with an increased VTE risk. Patients with VTE were also more likely to require ICU admission (OR = 15.08, 95% CI: 5.01 – 45.44, $p < 0.001$), mechanical ventilation (OR = 10.62, 95% CI: 4.05 – 27.91, $p < 0.001$), more operations (OR = 1.43, 95% CI: 1.29 – 1.59, $p < 0.001$) and a longer hospital stay (OR = 1.05, 95% CI: 1.04 – 1.07, $p < 0.001$).

Study 2

20 participants with >10% TBSA burns were recruited to the prospective study. Peak AFXa levels were measured for all 20 participants with 15% recording an initial prophylactic level. Upon subsequent measurements, 50% of participants reached a prophylactic peak AFXa level. Trough AFXa levels were measured for 17 participants with no participant recording an initial or subsequent trough AFXa level within the prophylactic threshold.

Conclusion

Our studies demonstrate a high incidence of VTE among burns patients at the VABS, especially among the major burns patients, and a thromboprophylaxis protocol that is ineffective in achieving prophylactic levels of AFXa level. We believe there is sufficient evidence to proceed to evaluate different dosing protocols among burns patients in order to improve AFXa levels. From the available literature, weight based dosing is currently the most effective and simplest method of determining initial enoxaparin dosing. Our findings support subsequent AFXa level monitoring to guide dose adjustment in order to maintain a prophylactic level. This should be conducted in the context of a clinical trial that not only measures levels, but monitors outcomes and adverse events.

Stephanie Ly

Journey Mapping in Palliative Care

Supervisor Names and Institute Affiliations:
A/Professor Peter Poon: Adj Assoc Professor, Monash University; Director of Supportive and Palliative Care Unit, Monash Health
Dr Fiona Runacres: Adjunct Lecturer, Monash University; Supportive and Palliative Care Unit Monash Health

After completing my 4th year of medicine, I decided to do a BMedSc(Hons) to explore an area of medicine that I was interested in and also learn some new skills in the process. This year has been a very different experience, learning about medicine, research and myself as a person. I have been challenged by statistical and qualitative analyses, deadlines, word limits, and so much uncertainty, but I'm glad I got the chance to have these experiences this year. Over the year, each of the BMedSc(Hons) students will have their own share of struggles but I was so grateful of the support of the students I had the pleasure to be around. The BMedSc(Hons) year has taught me a lot about taking things in stride and facing challenges head on to try and achieve my best and has been an invaluable year overall.

ABSTRACT

Background

Patterns of healthcare utilisation are evolving as a result of ageing populations and increasing burdens of chronic disease. With a growing number of people living longer with chronic diseases, there is a rising burden on both healthcare systems and patients. Palliative care is emerging as an approach that addresses these burdens and improves care at the end of life. However, there is a perpetuating cycle in which inconsistencies and barriers to palliative care delivery reflect poorly in research, resulting in a lack of strong evidence to motivate changes and improve care.
There is consequently, a growing need for new methods of examining palliative care to improve implementation and initiation of care. Using novel journey mapping techniques to explore the disease trajectory of palliative care patients may provide insight into current patterns of palliative care initiation and delivery, resource use and caregiver interactions to help researchers and clinicians identify gaps in care, potential "pivot points" and opportunities for improvement of care.

Aims

To 1) identify whether journey mapping has applications in clinical practice and palliative care, 2) determine potential "pivot points" and other opportunities for palliative care improvement and 3) better understand the current state of palliative care initiation and delivery.

Method

A multi-phase process involving journey map tool development and qualitative mixed-methods analysis incorporating an online modified Delphi and thematic analysis. Data was collected from a retrospective cohort of 104 palliative care patients for use in journey mapping tool development. Sixteen selected journey maps were further analysed by an expert panel of seven specialist palliative care team members through an online two-round Delphi process. NVivo 12 Plus software was used to analyse free-text comments using a constructivist grounded theory approach to thematic analysis.

Results

Despite the limitations of the journey mapping tool used in this study, there was still a strong overall consensus that journey mapping presented a more integrated continuous patient healthcare experience than conventional medical records. A journey mapping approach was also considered useful in identifying potential pivot points and opportunities to improve palliative care delivery. Participants identified the limitations of isolated terminal phase palliative care initiation and described various barriers to palliative care initiation and delivery, including patient and family factors, diagnosis and management-related factors and service barriers. Potential "pivot points" described included addressing barriers prematurely and facilitating patient education to enable better patient-centred care.

Conclusions

Journey mapping is able to convey information in more innovative and reflective ways than conventional methods and is an approach with significant potential for growth and development in clinical practice. The opportunities to improve palliative care identified in this study focus on recognising risk factors for barriers to care and providing patients with the resources, information and time needed to increase awareness of their own needs. This will facilitate better patient-centred palliative care by individualising initiation and sharing responsibilities of care. Journey mapping allows patient healthcare encounters to be viewed as a continuous journey rather than singular episodes, which will enable health care providers to deliver better patient-centred care.

Stephanie McKelvie

Intimate partner violence during pregnancy in Sanma, Vanuatu: a cross-sectional study of prevalence, patterns, determinants and association with mental health

Supervisor Names and Institute Affiliations:
Professor Jane Fisher AO - Monash University, Public Health and Preventive Medicine
Dr Basil Leodoro - Northern Provincial Hospital, Vanuatu

I chose and designed my project after spending a month in Vanuatu on an elective placement in 2018. While I was there, I discovered that violence against women is an alarmingly common human rights and health problem in Vanuatu and that intimate partner violence during pregnancy is an under-researched topic globally. Passionate about both women's and global health, I knew this was the project for me and have subsequently learnt so much, not only about my research topic but about research more generally too. I'm very grateful to everyone who supported and contributed to the study, I will look back on this year as a very meaningful time in my life. My advice to future students would be to choose a topic that excites you and that you believe is important and to foster good relationships with your supervisors and colleagues.

ABSTRACT

Background

Intimate partner violence (IPV) is a significant public health concern and human rights violation affecting women globally. Women face violence throughout their life course, including during pregnancy, and this victimisation places women at increased risk of a range of adverse health outcomes, including poor perinatal mental health. Around two thirds of women in Vanuatu have experienced physical or sexual violence by an intimate partner. However, little is known about IPV experienced by women who are pregnant in Vanuatu and local evidence is needed to inform policies, programmes and public services including healthcare services. The aim of this study was to describe the prevalence, patterns and determinants of psychological, physical and sexual IPV and associations between these experiences and mental health in women who are pregnant and attending antenatal care in a hospital setting in Sanma, Vanuatu.

Method

A cross-sectional study using interviewer-delivered questionnaires modified from the World Health Organization Women's Health and Life Experiences Questionnaire and Violence Against Women Instrument was conducted. Participating women were recruited from Northern Provincial Hospital general antenatal clinic and the prevalence of psychological, physical and sexual violence during the lifetime, current pregnancy and previous pregnancies were measured. Data analyses were performed with descriptive analyses and backwards logistic regression and linear regression models for associations.

Results

One hundred and ninety two women participated in the study and their mean age was 25.7 years and they were on average 27.3 weeks pregnant. More than one in two women had experienced at least one form of intimate partner violence during any pregnancy and 42.6% during the current pregnancy. Experience of violence during pregnancy was most commonly a continuation of violence occurring prior to pregnancy. Women's employment and partner substance use were significantly associated with experiencing IPV while having completed secondary school and living in an urban environment were protective against it. Experiencing IPV during the current pregnancy was significantly associated with more severe symptoms of perinatal mental health problems.

Conclusion

IPV perpetrated against women who are pregnant is a significant public health concern in Sanma, Vanuatu. Culturally appropriate, evidence-informed, effective interventions for women experiencing IPV in healthcare settings are needed to reduce preventable harm to women's health in Vanuatu.

Nadira Mohammad Ali Toha

Antibiotic Use in Treatment of Neonatal Sepsis in Indonesia

Supervisor Names and Institute Affiliations:
Cochrane Australia:
Dr. Tari Turner
Professor Sally Green

Hi! My name is Nadira Mohammad Ali Toha, people usually call me Dea. I'm a fourth-year student from Faculty of Medicine, Universitas Indonesia. I'm taking this cohort as a part of our international program. I have always been interested in the paediatric and OB/GYN department. Thankfully, I found this project about neonatal sepsis by Cochrane Australia. I did this project together with my friend, Khansa. To be honest, I was quite nervous at first as my supervisors had never supervised honours before; I thought they would have high expectations of me and expect me to do everything by myself. But it turns out they are always there every time we would like to discuss our project; either through email or coming to their offices. We can ask anything. There are no stupid questions. Also, my supervisors are very passionate about writing. Because of them, I learned a lot more about academic writing, which is not quite my strong suit. Besides my supervisors, a lot of people have been helping me, such as Britta and the SEA-URCHIN team. So, I'm glad and grateful that I could take this project, even more that I could spend this cohort with Tari and Sally.

ABSTRACT

Background

Neonatal sepsis is a substantial problem many of the aspects of which are still not clearly understood. While guidelines have been made for neonatal sepsis treatment, cases of antibiotics misuse are still frequent in many parts of the world, including Indonesia. Many factors may affect antibiotic prescription. In the case of neonatal sepsis, over prescription of antibiotics for its treatment may be partially due to its unclear diagnosis. However, before looking for solutions to rationalise antibiotic prescription, it is essential to understand how antibiotics are currently prescribed. This project will take the first step of antimicrobial prescription rationalization, by providing data on current antimicrobial prescription for early onset neonatal sepsis in Indonesia. This will lay the foundation for rationalization of antibiotics prescription which then underpin antimicrobial resistance prevention and control.

Aims

We aimed to describe the types of antibiotics prescribed, duration of antibiotic therapy and the pathogens cultured in neonates admitted to NICUs at three hospitals in Indonesia participating in the SEA-URCHIN project who received antibiotics within 3 days.

Method

This is a descriptive study which used data from NICUs in three hospitals in Indonesia collected for South East Asia- Using Research for Change in Hospital-acquired Infection in Neonates (SEA-URCHIN) project. Subjects of this study were neonates admitted to level 2 and 3 NICUs in the participating hospitals within 3 days of life. Neonates presenting three or more clinical signs or laboratory results suggesting sepsis and received antibiotics within 3 days of life for at least 5 consecutive days were suspected with EOS. The data used were collected by trained nurses from June 2012 to May 2013 and input to a secure, web-based database created especially for the SEA-URCHIN project. Simple descriptive characteristics of antibiotic use and identified pathogens, including counts and proportions were calculated using Stata 15.

Results

The overall antibiotic use rate from the NICUs was 41.4%, with the most commonly used agent for both initial and overall therapy in culture-proven and negative groups being amikacin. Similarly, amikacin was the most commonly prescribed agent for both culture groups in the regional and university hospitals, while at the district hospital without culture facilities, third-generation cephalosporins were more preferable. Infants without EOS in each hospital received various antimicrobial agents, most commonly gentamicin in the regional hospital, while university and district hospital most often gave ampicillin/amoxicillin and third-generation cephalosporin respectively. The therapy was conducted for longer than 7 days on average, with the longest median duration of therapy (20.5 days) given to culture-proven neonates in the university hospital. The most common pathogens identified are Burkholderia cepacia, Klebisella pneumonia (K. pneumoniae) and Pseudomonas aeruginosa.

Conclusions

A high proportion of neonates received antibiotics (41.4%), most commonly broad-spectrum agents, such as amikacin, gentamicin, ampicillin/amoxicillin and third-generation cephalosporin. The therapy was conducted for a long period of time, more than 7 days on average. Gram-negative bacteria are very common with Burkholderia cepacia at the top. In the future, it is essential to analyse the antimicrobial resistance data to examine the current prevalence.

Sarah Munday

How should we regulate reproductive selection for predicted intelligence? An ethical analysis of models regulating embryo selection for predicted intelligence using polygenic scores.

Supervisor Names and Institute Affiliations:
- Professor Julian Savulescu: Oxford Uehiro Centre for Practical Ethics, University of Oxford
- Doctor Hannah Maslen: Oxford Uehiro Centre for Practical Ethics, University of Oxford
- Professor Robert Sparrow: Monash University

I decided to do a BMedSc(Hons) after my 4th year of the MBBS degree. I was fortunate to be accepted into the Oxford Bioethics program, and so spent 9 months living and studying in Oxford. I have had the most incredible year learning about philosophy and ethics, as well as attending lectures, debates and events on a wide variety of interesting topics. This year has left me with new skills and knowledge, a newfound passion for bioethics and so many wonderful friends from all over the world. I can't recommend the bioethics program highly enough, and would be happy to speak to anyone interested in doing a BMedSc(Hons) in future (including the bioethics program).

My email address is **slmunday96@gmail.com.**

ABSTRACT

Background

In late 2018, a pivotal paper by Lee et al. was published in Nature Genetics. (1) This paper presented the results of a study which had come further than any other in understanding the genetics of intelligence. Through examining the genomes of 1.1 million participants, the researchers developed "polygenic scores" which could be used to predict intelligence using genetics alone. These scores, calculated for individuals and plotted on a bell-curve, can account for 7-10% of population variance in intelligence.(1) Within a few months of this publication, an American company began to offer to test embryos for "intellectual disability" using this technique in conjunction with preimplantation genetic diagnosis (PGD) and in vitro fertilisation (IVF) treatment. Essentially, this technology allows parents to select between potential future children on the basis of their predicted intelligence. The implications of this new ability are potentially vast, and much will depend on how it is regulated.(2) This research project sought to develop an ethical and practical model of regulation of this technology in Australia, and ultimately to respond to the following research question: How should Australia regulate the practice of embryo selection using preimplantation genetic diagnosis for predicted intelligence?
The thesis is divided into four chapters. It begins with a review of relevant background knowledge and literature in the field to situate the project in the current scientific and philosophical milieu (Chapter 1). The relationship between intelligence and wellbeing is also explored, and the complex interplay between ethics and public policy is touched upon. Chapter 2 offers evaluations of three pre-existing regulatory models for preimplantation genetic diagnosis and how they apply to this new test. These models have been selected as they encompass the majority of existing regulatory frameworks.

They are as follows:

1. Disease-based model: using Australia as an example

2. Unrestricted-use model: using America as an example

3. Prohibition model: using a historic Italian model as an example

The inclusion of the current Australian model serves the dual purpose of demonstrating a disease-based model and providing context for the proposed regulatory changes. Findings from the analysis of these models are used to inform the development of a new model.

Next, in Chapter 3 this new model – the "Welfare Model" - is proposed. This model permits PGD use to select against embryos who are predicted to be below a certain IQ cut-off which is relevant for welfare. This differs from current disease-based models which use arbitrary statistical cut-offs as their thresholds. It is proposed that predicted ability to complete secondary-school is a meaningful threshold which is relevant for welfare, and thus the best candidate in this setting. Ethical options for funding the model are also explored to highlight that funding concerns need not prevent the provision of this technology in line with the Welfare model.

Finally, Chapter 4 presents important objections to the model, and argues that none of these provides a compelling reason to prevent the adoption of the Welfare model.

Ruchira Nandurkar

Osmotic Effects on Urothelial Cell Viability

Supervisor Names and Institute Affiliations:
Prof Shomik Sengupta (Eastern Health Clinical School, Monash University, Box Hill Hospital)

My name is Ruchira, I completed my fourth year of medicine last year, and undertook my BMedSc(Hons) in uro-oncology with Prof Shomik Sengupta this year. I chose my supervisor and project for two major reasons; my interest in pursuing urology, and because I want to be involved in running clinical and laboratory-based trials in the future. Hence, an Honours year provided me with a perfect opportunity to gain some experience in research trials and to also see if I could see myself doing urology in the future. This year I was able to learn many useful laboratory skills, refine my abstract and research paper writing skills, finally understand statistics, and develop a more practiced and shrewd method of appraising published material. My supervisor has been amazing in providing me with so many additional opportunities as well. This year I gave two oral presentations and one poster presentation at regional and interstate conferences, and have three first author manuscripts in preparation for publication. I owe this all to the most amazing BMedSc(Hons) team at Eastern, and an incredibly supportive supervisor. I cannot recommend doing a BMedSc(Hons) at Eastern Health Clinical School enough.

Please contact me if you are interested!

ABSTRACT

Background

Recurrence of Non-Muscle Invasive Bladder Cancer (NMIBC) following initial transurethral resection of the bladder tumour (TURBT) is observed in 40-80% of patients. One cause of this is intraoperative tumour exfoliation during resection, leading to tumour cell re-implantation and local recurrence. Immediate post-TURBT instillation of intravesical chemotherapy is effective at reducing recurrence, but remains underutilised. A potentially less expensive and less toxic alternative may be to mechanically wash out free-floating tumour cells via irrigation. Irrigating with sterile water may be even more effective compared to iso-osmotic irrigants (such as saline) by virtue of osmotic cytolysis in addition to rinsing out exfoliated cells, although this has not been well characterised. The aim of this study was to ascertain the impact of water on cell viability on both in vitro and ex vivo samples.

Method

Two bladder cancer cell lines (HT1197 and HT1376) were cultured in vitro, and exposed to water, 0.9% saline or 1.5% glycine for up to five hours. Viable and non-viable cells (determined using Trypan Blue exclusion) were manually counted on a haemocytometer. Additionally, eleven patients receiving at least three hours of water irrigation following TURBT as part of a prospective pilot study were compared to 8 patients receiving saline irrigation. Post-operatively, 200mL of bladder washout was collected at 0, 1, 2, and 3 hours. Each sample was spun down and viable cells (determined using Trypan Blue exclusion) counted on a haemocytometer. Trends for cell numbers over time were assessed using Friedman's test, with statistical significance at $p<0.05$.

Results

In vitro, exposure to water led to a rapid decline in viable cells to zero within the first 20 minutes, whereas viable cell numbers slowly declined but remained detectable up to five hours when exposed to saline or glycine. For the eleven patients receiving water irrigation in vivo, the median viable cell count reduced from 20 x 103 at time 0 to zero cells within one hour and beyond ($p = 0.01$). In contrast, saline-irrigated patients had a median viable cell count of 50 x 103 initially, which decreased to 8 x 103 after one hour and then remained stable, never attaining 0% viability. Immunohistochemistry on ex vivo samples showed significant numbers of bladder epithelial cells in saline-irrigated patients, whilst bladder epithelial cells were not observed in washouts of water-irrigated patients at any time point.

Conclusions

Our results demonstrate that water has an osmotic cytolytic effect on bladder cancer cells in vitro and reduces the number of cells detected in catheter washout effluent in vivo, in addition to specifically reducing the number of bladder epithelial cells in irrigation washouts. Pending patient follow-up data on recurrence of bladder cancer in these water-irrigated patients, a short period of irrigation with water post-TURBT may be a viable intervention in reducing NMIBC recurrence.

Rhea Navani

Evolution of neonatal respiratory management strategies over time: a single-centre comparative analysis

Supervisor Names and Institute Affiliations:
Associate Professor Kenneth Tan (Monash University)
Professor Charles Roehr (University of Oxford)

With an interest in perinatology and a desire to study abroad, I feel fortunate to have had the opportunity to complete a BMedSc(Hons) based at the Oxford Newborn Care Unit in John Radcliffe Hospital. I feel incredibly grateful for the opportunity to have spent my days surrounded by esteemed clinician-researchers who are continually striving to improve outcomes for some of the most vulnerable members of our society. Through them, I was able to maintain my clinical knowledge whilst learning the fundamental basis of research skills. This included learning to systematically review the literature, extract, collect and analyse data and write scientifically. These skills will be invaluable for both clinical and research endeavours into the future. The experience was made even more incredible by the opportunity to live in Oxford for a year. Oxford has a very welcoming student culture and I'd like to thank all of the students who helped make this year so special. If you have an interest in studying abroad, I encourage you to take the leap of faith!

If you have any questions at all, please feel free to contact me
rhea.navani.97@gmail.com

ABSTRACT

Background

The respiratory management strategies of very premature neonates (<32 weeks of gestation) has evolved significantly with time. In 2016, John Radcliffe Hospital (Oxford) changed their guidelines significantly to recommend avoidance of mechanical ventilation, initial use of non-invasive ventilation, early caffeine use and selective surfactant as the key respiratory bundle to reduce rates of bronchopulmonary dysplasia (BPD). It is important to critically evaluate adherence to best practice guidelines, and therefore to identify the potential contribution of changing clinical practices in BPD reduction.

Aim

To characterise the changes in neonatal care provided over two distinct epochs at a single-centre, highly specialised tertiary perinatal centre, and to subsequently determine any impact on short and mid-term neonatal outcomes.

Methodology

A retrospective comparative study was conducted for all very premature neonates weighing less than 1500 grams admitted to Oxford Newborn Care Unit at John Radcliffe Hospital over an eight-month period in 2014 and in 2018-9. All infants were included, with the exception of those with major congenital abnormalities affecting life expectancies or those receiving care at the time of data analysis.

Results

A total of 172 infants were included in this comparative analysis – 84 from 2014 cohort and 88 from 2018-9 cohort. There were no significant demographical differences between the two cohorts. Although the rates of BPD and mortality decreased from 44.2% to 39.7%, and 15.1% to 11.4% respectively, these results were not statistically significant (p=0.598; p=0.465). This was despite a significant reduction in delivery room intubation (74.42% to 34.09%, p<0.0001) and intubation overall (80.23% to 61.36%, p<0.0001). Younger infants (<27 weeks) remained at higher risk of intubation compared to older infants (ε27 weeks), (OR: 4.67, 95%CI: 2.372 – 9.041, p<0.0001). The total duration of mechanical ventilation did not differ significantly between the two cohorts (2 days vs 1 day, p=0.197). Neonates were stratified into three groups – delivery room intubation, non-invasive ventilation (NIV) success (no requirement for intubation) or NIV failure (intubation at any point in neonatal care). Infants with NIV success had the lowest frequency of BPD diagnoses compared to those intubated at birth (19.15% vs 52.13%, p=0.0003) and those failing NIV (19.15% vs 43.75, p=0.013). There were no statistically significant differences in BPD diagnoses between those intubated at birth and those who failed NIV. The total duration of NIV did not differ significantly between the two cohorts (28 days vs 30 days, p=0.4674). The time to first caffeine dose reduced from 2 hours to 1.375 hours (p<0.0001) for inborn infants. Surfactant use significantly decreased between the two epochs (83.72% to 56.82%, p<0.0001). 14.58% of neonates succeeding on NIV received surfactant compared to 74.19% who failed NIV (p<0.0001).

Conclusion

Our results, contextualised within a tertiary perinatal centre, demonstrate that the care of extremely premature neonates can change to align with best evidence. These changes did not correlate with any statistically significant changes in BPD rate. Further areas of improvement could include strategies to identify infants failing NIV earlier, closely targeting surfactant use and timing and weaning from non-invasive ventilation earlier.

Polly Pavlidis

The efficacy of training videos for teaching opioid overdose management

Supervisor Names and Institute Affiliations:
Professor Sir John Strang – King's College London
Sibella Hare Breidahl – King's College London
Dr Toby Winton- Brown – Alfred Health

This year, after completing fourth year medicine, I went to London to undertake a BMedSc(Hons) at King's College London (KCL). I worked in the Addictions Department at KCL, developing and carrying out a project which assessed the efficacy of a brief training video we made for teaching opioid overdose management. I am extremely interested in addiction medicine which prompted me to seek out a project in that field, and I also have always wanted to complete some training overseas. The year, while stressful at times, has been an invaluable experience for developing my research skills, and also a great opportunity to learn a lot more about an area I am very interested in. I was given most of the responsibility regarding the design of the project and its completion, and additionally I had the opportunity to work with people who were doing various projects in the field of addiction medicine. I highly recommend the BMedSc(Hons) year not only to those who are interested in research but have a great interest in a specific area of medicine. It is a great opportunity to learn more about whatever area you are interested in while also adding to the research which is already out there.

ABSTRACT

Background

Opioid overdose is the leading cause of preventable death among people who inject drugs. Naloxone is the medication which reverses overdose and is available for public distribution to those who are most likely to witness overdose; namely people who use opioids, their family and friends, and staff of addiction services. Training provided in overdose management and naloxone use varies. Some countries have national naloxone programs where everyone receives the same standardised training. In England, training varies depending on where it is provided and by whom. Training programs have shown to be effective in improving people's knowledge of and attitudes toward overdose management, in addition to improving outcomes of overdose situations. Numerous forms of training have been studied, however there is a lack of evidence as to the efficacy of video tools for improving overdose management knowledge.

Aim

To assess the efficacy of a novel training video in comparison to the training usually done at the service.

Method

40 participants were recruited from a drug service in South London. Inclusion criteria were current opioid users aged 18 and over, and willing to attend for follow-up. The first 10 participants received training as usual (TAU) and the second 10 received video training (VT), which was repeated with the following 20 participants. Participants completed two questionnaires, the Opioid Overdose Knowledge Scale (OOKS) and the Opioid Overdose Attitudes Scale (OOAS) three times; once before training, once immediately after, and at one-month follow-up. These scales assess knowledge of and attitudes toward overdose management, and scores were compared before and after training for both groups.

Results

Both forms of training improved participants' knowledge, however VT did this to a greater extent. Average scores improved from 31.95 (±6.62) at baseline to 38.15 (±3.72) after training, compared to 33.90 (±5.72) and 35.20 (±4.93) in the TAU group. OOAS results improved in both groups after training, again to a greater extent in the VT group. Average scores improved from 102.75 (±15.07) to 114.20 (±12.67) in the VT group and from 107.95 (±12.87) to 115.75 (±15.12) in the TAU group, however this was not statistically significant. At the time of writing nine participants were available for follow-up, only two of whom had seen the training video, so it is difficult to determine the effect of training on knowledge retention until more data has been collected.

Conclusions

VT resulted in a greater improvement in both OOKS and OOAS scores after training than TAU. Video tools have the potential to create consistent and efficient method of delivering training and can improve accessibility to clients by being distributed remotely and online.

Shalini Ponnampalam

Placental Maturation: Does one size fit all? An investigation into placental biomarkers of maturation and growth in South Asian women.

Supervisor Names and Institute Affiliations:
Dr Miranda Davies-Tuck[1,2], Dr Stacey Ellery[1,2]
[1]The Ritchie Centre, Hudson Institute of Medical Research
[2]Department of Obstetrics and Gynaecology, Monash University, Clayton, Australia

I completed my BMedSc(Hons) in 2019 after completing fourth year (2018). Being an ERC student, this year gave me the opportunity to engage with the metropolitan hospitals whilst moving back home. Initially, when I began approaching would-be supervisors a lab-focused project was not what I was looking for, it was the project type I had ruled out. But whilst searching for my most suitable project, it was the foreign environment that is the lab, and the opportunity to generate my own data that drew me to my South Asian (SA) placenta project. Being of South Asian origin myself, I was further motivated to engage in this project, as there is a certain passion that comes with investigating the 'why' in understanding why the poor pregnancy outcomes such as stillbirth and SGA occur in SA women. It was definitely a challenging year, with many hours spent in the lab, and days where my lab work simply didn't work and needed to be repeated. Nonetheless, I found it empowering to work on my own samples to generate data to analyse. The skills I learnt are so diverse to those offered during hospital rounds. My Honours year has been a rewarding and valuable experience.

ABSTRACT

Background

Current antenatal investigations are limited in their capacity to predict and detect the fetus at risk of in utero compromise. With the theory of accelerated placental maturation proposed to drive adverse outcomes for South Asian (SA) women, using placental factors involved in growth and maturation as biomarkers may improve pregnancy management and neonatal outcomes. For this to be effective, we must first understand race-based variation in the activity of feto-placental maturation and growth hormonal axes.

Aim

To quantitatively measure placental gene expression for markers associated with placental maturation and growth between Caucasian and SA women, in order to (i) evaluate whether these hormonal axes act differently in SA pregnancies contributing to their adverse outcomes; and (ii) evaluate whether any of these hormones, such as CRH, have utility as a predictive biomarker.

Method

Placental samples collected from Caucasian and SA women, and stored in the CPO Bio-Bank, where utilised for this study. RNA was extracted from placental samples of low-risk healthy women with singleton pregnancies. We synthesised cDNA for subsequent RT-qPCR analysis for placental mRNA expression using Fluidigm technology and the delta- delta CT ($^{\Delta\Delta}$CT) method of gene expression analysis (house-keeper reference gene (18S rRNA)). Gene expression results were correlated to particular maternal characteristics and birth outcomes retrieved from the CPO Data-bank.

Results

The total population was 123 women (91 Caucasian, 32 SA). Between the two ethnic groups, there were no significant differences in gestational age or mode of delivery for vaginal delivery (Caucasian: 75.8%, SA: 62.5%) or caesarean section (Caucasian: 24.2%, SA: 37.5%). For women who laboured spontaneously, a significantly shorter mean gestation length was observed for SA women (38.85 weeks vs. 39.68 weeks, p=0.024). We did not find any statistically significant differences in placental gene expression for the markers or placental growth and maturation between the SA and Caucasian women. Although not always statistically significant, our study demonstrated that (i) CRH activity and associated maturation may be reduced in women with non-spontaneous labour induction; (ii) reduced 11-βHSD2 mRNA expression in the SA placentae may be contributing to early fetal maturation, and thus, shorter gestation lengths; (iii) placentae of SA women express a higher degree of PlGF mRNA compared to the Caucasian placentae; (iv) antagonising insulin-like growth factor (IGF) activity exists in the SA and Caucasian placentae with lower IGF-I bioavailability in the SA non-spontaneously labouring population; and finally (v) greater associations exist between the maturation and growth axis in the SA, rather than Caucasian placentae.

Conclusions

This study identified variations in placental gene expression between Caucasian and SA women, for markers representing feto-placental maturation and growth. Although our results did not always reach statistical significance, biological significance cannot be excluded. Our results suggest a 'biomarker package' with CRH and growth-mediators (i.e. PlGF) may provide scope for assessing maturation and the time-point, if present, of placental insufficiency. However, further assessment of ethnic-based differences in this hormonal activity is warranted prior to biomarker implementation. More specifically, this workflow should enable characterisation of validity of presumed 'accelerated maturation' in SA pregnancies.

Emily Pryor

Respiratory distress in the newborn: understanding mechanisms regulating poor lung function

Supervisor Names and Institute Affiliations:
Prof Stuart Hooper, Hudson Institute of Medical Research / Monash University
Dr Erin McGillick, Hudson Institute of Medical Research / Monash University

I chose to do a BMedSc(Hons) after finishing 4th year. The Ritchie Centre was an amazing environment to work in as there's plenty of other students and researchers, I always felt engaged and well supported, and their fetal and neonatal research is fascinating. For example, they're often running fetal surgery or newborn ventilation experiments in the animal house downstairs, which I've been able to attend. I've learnt more about physiology this year than I did in the entirety of my preclinical years, and my supervisors have really taught me the importance of not just asking what we know, but how we know it.

ABSTRACT

Background

Respiratory distress at birth is common, with more than 7% of newborns requiring some form of respiratory support in the delivery room. Lung liquid clearance is fundamental to the transition to air-breathing and initiates major changes in cardiopulmonary physiology, and as such, respiratory support which clears lung liquid rapidly and uniformly will help support infants suffering from respiratory distress at birth. The best way to clear lung liquid is currently unknown. However, as inspiration is a major driver of lung liquid clearance at birth, the inflation time provided to infants during intermittent positive pressure ventilation is a potential target.

Aim

Aim 1 investigated the effect of increasing the inflation time on the lung mechanics and the rate and uniformity of aeration in preterm newborn rabbit kittens with non-uniform lung liquid clearance. Aim 2 investigated if the addition of surfactant could compensate for the effect of a short inflation time on lung mechanics and aeration.

Method

Preterm rabbit kittens (29 days gestation, term ~32 days) were intubated and mechanically ventilated to clear liquid from one lung only, creating a model of non-uniform liquid clearance. Kittens were then mechanically ventilated in both lungs with an inflation time of 0.2, 0.5 or 1.0s (Aim 1), with or without surfactant (Curosurf 200mg/kg; Aim 2), until they reached a stable tidal volume of 8mL/kg. Simultaneous synchrotron phase contrast X-ray imaging (Australian Synchrotron) and plethysmography were used to determine lung aeration and lung mechanics respectively.

Results

Kittens ventilated with shorter inflation times (0.2s and 0.5s) took longer to reach the target tidal volume and had a lower dynamic lung compliance for the same total amount of pressure applied during the bilateral lung inflation. They visually appeared to have less uniform lung aeration, compared to kittens with a 1.0s inflation time. The addition of surfactant was able to compensate for the effects of a short inflation time by improving lung mechanics in kittens with an inflation time of 0.5s, but not in those given an inflation time of 0.2s. Surfactant visually improved the uniformity of aeration in all groups.

Conclusions

Current Australian guidelines recommend inflation times of 0.3s to 0.5s when resuscitating and ventilating preterm infants. These short inflation times were insufficient at supporting lung liquid clearance and newborn physiology during the transition to air-breathing in ventilated preterm rabbits. This could form a foundation for future studies investigating the most effective way to provide respiratory support in the delivery room.

Irushi Ratnayake

Implementation of Patient-Reported Outcome Measures (PROMs) in the Australian Cystic Fibrosis Data Registry

Supervisor Names and Institute Affiliations:
Dr Rasa Ruseckaite – School of Public Health and Preventive Medicine
Associate Professor Susannah Ahern - School of Public Health and Preventive Medicine

I chose to undertake a BMedSc(Hons) after completing fourth year to take a break from clinical medicine and to learn more about research. I found this study on the project database and it appealed to me because I have an interest in public health, paediatrics and it was a qualitative study. I really enjoyed conducting a qualitative study because it allowed interaction with patients and clinicians and encouraged exploring issues through the perspectives of others. It was different from anything I've done previously in medicine and I found it interesting and fun. Throughout the year, I felt supported and encouraged by my supervisors and the resources available at the School of Public Health. I've learnt countless new skills and developed confidence in public speaking and presentations. I would recommend conducting research at School of Public Health as I found it a friendly and supportive environment.

I am happy to be contacted at
irat2@student.monash.edu

ABSTRACT

Background

In light of significant treatment and demographic changes in Cystic Fibrosis (CF) in recent decades, there is a growing need to address psychosocial factors in the management of CF. Health-Related Quality Of Life (HRQOL), measured using Patient-Reported Outcome Measures (PROMs), is gaining popularity as an assessment of psychosocial health. The Australian Cystic Fibrosis Data Registry (ACFDR) is considering routine HRQOL PROM data collection. This would enable measurement of long term HRQOL outcomes, benchmarking of HRQOL information and facilitate HRQOL research. We conducted a systematic review which identified two PROMs, the Cystic Fibrosis Questionnaire-Revised (CFQ-R) and Cystic Fibrosis Quality of Life questionnaire (CFQoL) that may be suitable for incorporation in the ACFDR. The acceptability and feasibility of incorporating these PROMs in the ACFDR were assessed in this qualitative study.

Aims

1) To assess the feasibility of incorporating a PROM into ACFDR for patients, caregivers and clinicians.

2) Determine whether the CFQ-R and CFQoL are suitable for ACFDR implementation by assessing patient, caregiver and clinician perspectives on relevance, clarity, acceptability and clinical applicability of the two PROMs.

Methods

We conducted a qualitative descriptive study using a purposive sample of CF patients, caregivers and clinicians. One researcher (IR) conducted semi-structured telephone interviews with individual participants using an interview form. Interviews were transcribed using paid transcription services. NVivo 11 was used to analyse data using conventional content analysis.

Results

A sample of five patients, seven caregivers and thirteen clinicians were interviewed. Three major topics emerged from the data analysis. The first was the utility of HRQOL data. Participants agreed that data could demonstrate population-level trends and could be used as a tool in clinical consultations. However, some participants identified that HRQOL data collected using PROMs may have inaccuracies. Secondly, PROM incorporation in the ACFDR was found to be feasible, with electronic and in clinic administration preferred. Finally, both PROMs were found to have some limitations. The CFQoL was the preferred tool for adults, but included some irrelevant and confronting items. The CFQ-R was the preferred tool for children and all items were acceptable.

Conclusion

This is the first study to describe incorporation of a PROM in a CF clinical registry. This study provides key recommendations for the use of PROMs in the modern CF population. Qualitative interviews identified CFQoL was preferred in adults and CFQ-R preferred in paediatrics. In addition, this study identified preferred methods of administration of PROMs in a CF population.

Prithi Rajiv

The Role of Maternal Serum sFlt-1 and PlGF in the Detection of Chronic Placental Insufficiency Leading to Fetal Growth Restriction.

Supervisor Names and Institute Affiliations:
Professor Shaun Brennecke, The Royal Women's Hospital, Department of Maternal Fetal Medicine
Dr Tom Cade, The Royal Women's Hospital, Department of Maternal Fetal Medicine
Dr Gabriel Jones, The Royal Women's Hospital, Department of Maternal Fetal Medicine

I undertook my Bachelor of Medical Science degree after my fourth year of medicine. I chose to go down this pathway as I was looking for something different to break up the years of clinical placement. I was also keen to learn how to undertake research. I conducted my research at the Department of Maternal Fetal Medicine at The Royal Women's Hospital which provided me with plenty of opportunities to meet clinicians and midwives who all shared my passion for women's health. This experience gave me an opportunity to learn how research translates into clinical practice and allowed me to work alongside passionate individuals who were great sources of support throughout the year. The BMedSc(Hons) year was ultimately an opportunity that opened so many doors for me in terms of pursuing a career as a clinician researcher. For those who are unsure if they are interested in research, this opportunity provides a structured course to learn the skills of research while being supported by your supervisors, the Monash department and your peers throughout the year. It was truly an unforgettable experience!

Feel free to contact me at **praj28@student.monash.edu** if you have any questions.

ABSTRACT

Background

Fetal growth restriction (FGR) secondary to chronic placental insufficiency is a major cause of perinatal morbidity and mortality. As there is no gold standard definition for FGR, small for gestational age (SGA) is often used as a surrogate definition described as birthweight < 10th percentile. However, not all SGA pregnancies are growth restricted. Some SGA are constitutionally small and otherwise healthy. It is important to distinguish between FGR and healthy SGA pregnancies to ensure appropriate interventions are provided in FGR cases and to minimise unnecessary interventions in healthy SGA cases. The maternal serum ratio of soluble fms-like tyrosine kinase-1 (sFlt-1) and placental growth factor (PlGF) is an indicator of placental insufficiency in the latter half of pregnancy. As such, the sFlt-1/PlGF ratio may be a clinically useful tool to distinguish between FGR and healthy SGA pregnancies.

Objectives of the Study

The aim of this study was to determine if the sFlt-1/PlGF ratio could distinguish between FGR and heathy SGA in pregnancies of birthweight < 10th percentile. Secondary analyses determined if the sFlt-1/PlGF ratio distinguished between these populations when controlling for preeclampsia, which is a known confounder of the ratio. Exploratory post hoc analyses considered the association between the sFlt-1/PlGF ratio and birthweight percentiles.

Methods

A retrospective audit of women delivering an infant of birthweight < 10th percentile at the Royal Women's Hospital between September 2016 and July 2019 was undertaken. A comparison of maternal serum sFlt-1/PlGF ratios in FGR (n=82) and SGA (n=90) cases occurred. FGR cases had indicators of placental insufficiency and poor fetal growth such as reduced amniotic fluid index, abnormal fetal vessel Dopplers, abnormal cardiotocography findings, and/or relevant placental histopathology findings. SGA cases did not have abnormalities in the above indicators. To evaluate the association between the sFlt-1/PlGF ratio and birthweight percentiles, the study cohort was reclassified based on birthweight alone. Pregnancies of birthweight < 5th and < 3rd percentile were considered.

Results

The sFlt-1/PlGF ratio was higher in FGR cases when compared to SGA cases (238.8 ± 31.4 vs 65.4 ± 8.7 respectively, p<0.0001). When controlling for preeclampsia, the sFlt-1/PlGF ratio was positively correlated with an FGR outcome (ß= 0.9168, 95% CI; 0.4930 – 1.3407, p<0.0001). The sFlt-1/PlGF ratio was also negatively correlated with birthweight percentiles (r = –0.3103, p<0.0001). In pregnancies of birthweight < 5th percentile, the sFlt-1/PlGF ratio was statistically significantly higher than pregnancies of birthweight > 5th percentile (192.9 ± 25.5 vs 96.5 ± 20.2 respectively, p=0.0009). Likewise in pregnancies of birthweight < 3rd percentile, the sFlt-1/PlGF ratio was statistically significantly higher than pregnancies of birthweight > 3rd percentile (219.8 ± 32.7 vs 107.6 ± 18.0 respectively, p=0.0002).

Conclusion

The sFlt-1/PlGF ratio was statistically significantly higher in FGR compared to healthy SGA pregnancies of birthweight < 10th percentile. This association was found to be independent of preeclampsia. As such, the sFlt-1/PlGF ratio may be a clinically useful tool to delineate pathologically small and physiologically small pregnancies. The association between the sFlt-1/PlGF ratio and birthweight percentiles may be useful for determining disease severity in FGR pregnancies.

Sai Ram Ramisetty

What is learned from an Australian older person Health Assessment?

Supervisor Names and Institute Affiliations:
Dr Eleanor Mitchell, Dr Angelo D'Amore, Dr Ruth Chantler – School of Rural Health (East Gippsland)

I wanted to do a BMedSc(Hons) year to learn more about what working in medical research and academia involved. I chose this project as I was able to complete most of it from home, by distance through the School of Rural Health. It was a fun year and my supervisors helped me to get everything I wanted out of it.

ABSTRACT

Background

Health assessments are available for at-risk patients in Australia to provide an opportunity to detect and manage chronic conditions by their General Practitioner (GP). Health assessments for Australians aged 75 years and older (75+HAs) are available for patients to undertake annually. Although 75+HAs have been available for nearly 20 years, uptake remains low, with fewer than 1 in 5 Australians over 75 receiving a 75+HA in 2010. Currently, little is known about the efficacy of 75+HAs, particularly regarding what new information, regarding health problems, is gathered at 75+HAs. This research aimed to examine what new health problems are identified from performing 75+HAs, and how they differ from those identified at previous standard GP consultations.

Method

A retrospective patient record study was undertaken at a metropolitan Melbourne and a rural South Gippsland GP clinic from June to August 2019. Parameters measured included newly identified chronic conditions, new management for previously diagnosed chronic conditions, medication management, referrals, vaccinations, and positive test results for the monitoring of previously diagnosed chronic conditions. Statistical analysis was undertaken to compare these parameters between a patient's most recent 75+HA and standard GP consultations in the 24 months prior to their most recent 75+HA.

Results

A total of 223 patients were invited to participate, and 195 patients were included in the analysis, all of whom were recipients of a 75+HA. No significant difference was found in the number of new chronic conditions recorded at patients' most recent 75+HA and at standard GP consultations in the prior 24 months. However, significant differences in the types of conditions recorded at 75+HAs and prior standard GP consultations were found, with 75+HAs being significantly more likely to record elevated lipids ($p<0.001$), vitamin D deficiencies ($p=0.004$), eye/vision-related conditions ($p=0.011$), diabetes ($p=0.019$), and hearing conditions ($p=0.045$) compared to standard GP consultations. Standard GP consultations were more likely to record skin ($p<0.001$), musculoskeletal ($p=0.013$), cardiovascular ($p=0.007$), respiratory ($p=0.014$) and urological problems ($p=0.045$) compared to 75+HA. Significantly more referrals ($p<0.001$) and new management of previously diagnosed conditions ($p=0.009$) occurred at 75+HA than at standard GP consultations, while standard GP consultations resulted in significantly more vaccinations ($p<0.001$) and positive test results for the monitoring of previously diagnosed conditions ($p<0.001$) than 75+HAs. Patients who were receiving their first 75+HA were significantly more likely to receive vaccinations at their 75+HA than those who had previously received a 75+HA ($p=0.022$).

Conclusions

Our study suggests that 75+HAs fulfil a role in addressing chronic health problems in older patients that may otherwise have been overlooked at standard GP consultations.

Bridget Roddis

Criteria Led Discharge for Simple Appendicitis in Children.

Supervisor Names and Institute Affiliations:
Supervisor: Mr Ram Nataraja
Department of Paediatric Surgery, Monash Health
Senior Lecturer, Department of Paediatrics, Faculty of Medicine, Nursing and Health Science, Monash University
Co-Supervisor: Mr Maurizio Pacilli
Department of Paediatric Surgery, Monash Health
Senior Lecturer, Department of Paediatrics, Faculty of Medicine, Nursing and Health Science, Monash University

I choose to complete an Honours project to give myself the chance to see if the research world was for me. I ended up learning so much, and being able to be involved in every part of research from protocol development through to analysis and writing up of results has been really interesting. I think Honours is a great opportunity to give yourself a mental change from the intensity of clinical medicine and really delve into a research topic of interest in a way we otherwise don't get the opportunity to. For future students, given it is a full-on year I think it is important to carefully choose your topic and make sure you understand the expectations of your supervisor. If you really like clinical medicine choose a clinical project or if you have an interest basic sciences likewise. Keep your social world going as research can be a bit isolating in comparison to other years of the degree and it is great to have support to with you for both the highs and lows of an Honours year.

ABSTRACT

Background

Expedited discharge protocols have been investigated for children with appendicitis as a way to increase efficiency of their discharge from hospital. These interventions come in several forms and have been demonstrated to be safe and successful. It is proposed that a prospective cohort study is undertaken to investigate the outcomes of a criteria led discharge (CLD) protocol for patients with simple appendicitis. Parental satisfaction before and after introduction of CLD will also be investigated. It is expected CLD will reduce average postoperative length of stay (pLOS) and be as safe and acceptable to patients as standard discharge.

Methods

A CLD pro forma was developed that indicated set clinical criteria and standardised care guidelines for all children with simple appendicitis. A parent and guardian survey was written to assess quality of life and their perceptions of their child's discharge time. The study period for the prospective control group was from 1st March to 30th June 2019 where an observation of standard discharge practice was undertaken. The CLD patient group was recruited from 1st July to 31st August 2019. The primary outcome measure is pLOS, with consideration also given to parent satisfaction with discharge, surgical complications and patient quality of life following discharge.

Results

Outcomes for an interim analysis of 31 patients in the control group were compared to 18 patients in the CLD group. There was no difference in the median pLOS (24 versus 25.4 hours, p=0.60). Furthermore, there were no significant differences on any secondary outcomes. A subgroup analysis of the CLD group showed patients discharged with the CLD form were discharged faster than those who received a medical review prior to discharge (23.8 versus 29.5 hours p=0.02). Parental confidence with time of discharge was demonstrated to be very high in both control (85.7%) and CLD (91.7%) groups.

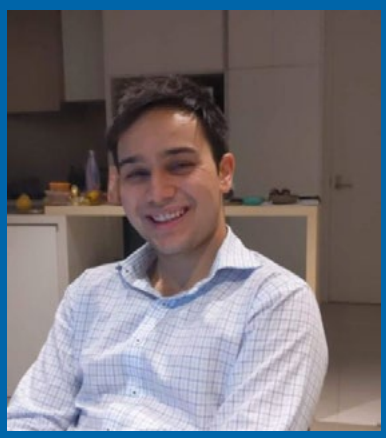
Conclusion

In a hospital with a pre-existing efficient discharge practice and the availability of a paediatric surgical team to conduct regular reviews, the benefit of expedited discharge protocols may be somewhat limited. Nonetheless, CLD was found to be safe and acceptable to parents and may reduce extent of variability in postoperative care. Patients within the CLD group discharged using the CLD form, compared to medical review discharges, were discharged faster. This demonstrates CLD is appropriate for identifying and discharging efficiently patients who are recovering quickly and do not have clinical concerns in the postoperative period. It is important that clinicians have the flexibility to make individual adjustments that respond to emerging clinical and social factors. It is noted that both standard discharge and CLD were able to facilitate this personalised and flexible treatment response. Recruitment for the CLD group will continue beyond the results of this thesis, allowing for more in-depth analyses of clinical outcomes after introducing CLD.

Liam Safe

Tracking Functional Immune Reconstitution Following Allogeneic Haemopoietic Stem Cell Transplantation

Supervisor Names and Institute Affiliations:
Supervisor: Dr Orla Morrissey, Alfred Health, Department of Infectious Diseases
Co-Supervisor: A/Prof Rosemary Ffrench, Burnet Institute



I commenced this project after completing fourth year, hoping to gain some experience in research and to have a short break from clinical medicine. This was my first taste of research, so I had no idea what to expect. Overall, this year turned out to be one of the most challenging and rewarding to-date. The start of the year was a steep learning curve and had me questioning at times why I had chosen a lab-based project. However, as I got more familiar with the project and more comfortable in the lab, I found a new sense of enjoyment in what I was doing. Whilst the project wasn't easy, it was a whole new experience and I have come out of the year feeling like I have learnt plenty. I have gained some great insights into medical research and feel proud of the small contribution which I made. I would like to thank my supervisors and support network who were fantastic, as well as the Department of Infectious Diseases at Alfred Health for being so welcoming.

I am more than happy to be contacted by anyone who has questions
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ABSTRACT

Background

Allogeneic haemopoietic stem cell transplantation (allo-HSCT) is used to cure haematological malignancies. The conditioning and immunosuppression regimens given during and post-transplant cause profound immunocompromise in graft recipients. This makes them vulnerable to many opportunistic and vaccine-preventable infections; a significant source of mortality. Antimicrobial prophylaxis and vaccinations are frequently used to prevent infection in this setting, often according to fixed schedules. However, the optimal timing of these interventions is poorly-defined, limiting their effectiveness. The timing of these interventions could be more precisely guided by using a panel of biomarkers to predict immune function.

Method

The aim of this research was to characterise the kinetics of immune recovery following allo-HSCT and correlate laboratory data with clinical outcomes to identify a panel of biomarkers of immune recovery. Clinical data were collected from twenty patients undergoing allo-HSCT at Alfred Health between January and September 2016. Peripheral blood mononuclear cells (PBMCs) and serum were purified from samples collected at the time of conditioning therapy and 3-,6-,9- and 12 months post-transplantation. In this research, these samples were tested using several immunological assays including immunophenotyping and immunoglobulin isotyping. The capacity to respond to pathogens and vaccines was assessed using a lymphocyte proliferation assay and cytokine profiling after in-vitro stimulation. PBMCs and serum were also collected from 10 healthy donors and analysed using the same assays for comparison.

Results

Median B-, T- and CD8 T-cell counts returned to normal range at 6 months, whereas median CD4 T-cells remained below the lower limit of normal (LLN) for 12 months post-HSCT. Positive proliferative responses to the pathogens and vaccines tested recovered at different times following allo-HSCT and were significantly less when compared with healthy donors. Proliferative responses were rarely detected before 6 months and were not detected until 12-months against Aspergillus. The concentrations of several cytokines were found to have a positive correlation with proliferation, depending on the antigen used ($p<0.001$ for interferon-γ and cytomegalovirus-Epstein-Barr virus-influenza-tetanus peptides, diphtheria-tetanus-pertussis [DTP] vaccine, Streptococcus pneumoniae vaccine and influenza vaccine; IL-22 for DTP and Influenza vaccine; sCD40L for DTP vaccine; and IL-4 for DTP vaccine). Immunoglobulin isotypes recovered in the order of IgM, IgG then IgA. The IgA and IgG2 levels remained below the LLN for the entire 12-months of follow-up and were statistically significantly lower than the levels for healthy donors. Patients who received myeloablative conditioning were more likely to have higher counts of CD4 T-cells and IgA levels 12-months post-HSCT compared with those who had non-myeloablative conditioning ($p=0.002$ and $p=0.045$, respectively).

Conclusions

Our findings contribute further information about the kinetics of immune recovery following allo-HSCT in the modern era. They reinforce the concept that immune recovery is slow and highly variable between patients and is often incomplete after 12 months. Several immune parameters have been identified in this study which could serve as markers of immune function including CD4 T-cell counts, selected cytokines (IFN-γ, IL-1β, IL-4, IL-6, IL-17, IL-21, IL-31, TNF-α, IL-22, IL-23 and sCD40L) and immunoglobulin isotypes. Pending validation in larger studies, these could assist in clinical decision-making regarding the timing of vaccinations and antimicrobial prophylaxis following allo-HSCT.

Khansa Salsabila

Early-onset Neonatal Sepsis (EOS) in Indonesia

Supervisor Names and Institute Affiliations:
Dr Tari Turner and Professor Sally Green
Cochrane Australia, School of Public Health and Preventive Medicine, Monash University

Hi! I'm Khansa. I am currently in my 4th year of medical school from Universitas Indonesia. This Honours year have been a blast for me and it was surely one of the best experience of my life! I decided to take part in Tari and Sally's project since I've always been intrigued in either paediatrics or obstetrics. From the numerous project to choose from based on that particular topic alone, the idea of doing a project that may have an impact of some sort to Indonesia really caught my eye. I am extremely fortunate to be working alongside my supervisors, they both have inspired me and have shown me how vital and invaluable research could be and I am very grateful for that. I certainly have learned so much important research skills in the past 8 months of the BMedSc(Hons) program. I get to be better at giving oral presentations, especially to a crowd with very different areas of expertise, improved my skills in writing and statistical analyses, and also managed to search the literature efficiently. I am 100% positive that the knowledge I have gained this year will be useful for my medical career. I would highly recommend future students to undertake the BMedSc(Hons) program just because it was a truly worthy experience.

ABSTRACT

Background

Early-onset sepsis (EOS) is an infection acquired by newborns in the first 72 hours of life. It is a major leading cause of neonatal mortality and morbidity. In Indonesia, the proportion of neonatal deaths caused by sepsis reached 11.3% in 2017 and this proportion has not substantially improved in almost two decades. This is because Indonesia, as a middle-income country, encounters complex challenges in accurately diagnosing and treating EOS. Diagnosing EOS is difficult because of its unspecific clinical signs, but it is even more challenging in low resource settings where blood culture, is not readily available hence in such settings, tackling sepsis remains a problem. However, sepsis can be overcome if improvements are made in areas of prevention, diagnosis, and treatments.

Method

This is a descriptive study nested under the South East Asia-Using Research for Change in Hospital-acquired Infection in Neonates project. The data we analysed was extracted from medical records of three participating Indonesian hospitals during the pre-intervention period (June 2012 – May 2013) of the project. Our study population comprised of neonatal admissions to NICUat less than 72 hours of life. Neonates who showed three or more clinical signs or laboratory results consistent with EOS and received antibiotics for 5 consecutive days were suspected with EOS. The growth of an eligible organism from the neonate's culture was defined as culture-proven EOS. We undertook a univariate analysis using STATA 15.0, and described the data as continuous variables (mean and standard deviation) and categorical variables (frequency, percentages).

Results

Of 2,565 neonates, 242 cases were suspected with EOS (9.4%) and culture-proven EOS -accounted for 3.3% of the cases (83/242). Prematurity and underweight were observed in 154 (63.6%) and 178 (73.6%) suspected neonates, respectively. In the first 14 days, 42 neonates (17.4%) with EOS died and by day-28, a further 10 (52/242; 21.5%) had died. Cardiorespiratory diseases and infection were responsible for 9.5% (23/242) and 8.3% (20/242) of the deaths, respectively.

Conclusion

Across the three participating NICUs, 9.4% of neonatal admissions were presented with signs of sepsis with in 72 hours after birth and 3.3% of them were culture-proven. The characteristics observed in those suspected with EOS in this study were consistent with the risk factors commonly seen in EOS cases, such as prematurity and underweight. However, further research is needed for confirming whether these factors are in fact associated with EOS or not.

Regina Puspa Utami Satyana

Health and Economic Burden of Smoking in Indonesia

Supervisor Names and Institute Affiliations:

A/Professor Zanfina Ademi Delaney – Centre of Cardiovascular Research and Education in Therapeutics (CCRET), School of Public Health and Preventive Medicine, Monash University

Professor Danny Liew – Centre of Cardiovascular Research and Education in Therapeutics (CCRET), School of Public Health and Preventive Medicine, Monash University

Professor Dianna Magliano – Diabetes and Population Health Laboratory, Baker Heart and Diabetes Institute

My name is Regina and I am a fourth-year medical student from Universitas Indonesia. This Honours year at Monash University was amazing and is one of the best years in my life. Here, I got the chance to learn more about research (especially regarding this project) and, most importantly, how to develop critical thinking. I also consider myself to be incredibly lucky as I was able to learn all of them from the best teachers, my supervisors. In addition to that, living overseas independently and meeting people from different backgrounds were really priceless. I was truly amazed by what I have achieved by the end of the course. For future students, I hope you enjoy your Honours year and learn a lot of things in the process. It will be one of the most memorable and valuable year you have ever experienced!

ABSTRACT

Background

While the prevalence of smoking worldwide has been trending down over recent years, it is increasing in Indonesia. At present, the prevalence of smoking among Indonesian males, especially those of working age, is the highest in the world. Smoking-related mortality and morbidity has been well-described by many studies, but its impact on productivity at population levels in Indonesia remains unknown.

Aims

To estimate the impact of smoking in the Indonesian population of working-age in terms of years of life lost, quality-adjusted life years (QALYs) lost, productivity-adjusted life years (PALYs) lost and healthcare costs.

Methods

Life-table modelling of Indonesian smokers age 15 to 54 years, followed-up until 55 years (retirement age). Contemporary data on demographic, mortality and prevalence of smoking were derived from the Institute for Health Metrics and Evaluation and the World Health Organisation. The population attributable risk, health-attributable quality of life decrements and relative reduction in productivity due to smoking were from published sources. The analysis was repeated but with the assumption the cohorts were non-smokers. The differences in results represented the losses incurred by smoking. Gross domestic product (GDP) per equivalent full-time (EFT) worker (USD 11,765) was used for estimation of the cost of each PALY.

Results

The prevalence of smoking among Indonesian working-age males and females were 67.0% and 7.9%, respectively. This study estimated that smoking caused 667,556 excess deaths, 1.6 million years of life lost (0.26%, 0.03 per person), 32.9 million QALYs lost (5.74%, 0.57 per person) and 11.9 million PALYs lost (2.16%, 0.21 lost per person). The total cost of productivity loss due to smoking amounted to USD 139.8 billion. Healthcare costs devoted to smoking-associated diseases was predicted to be USD 1.6 trillion.

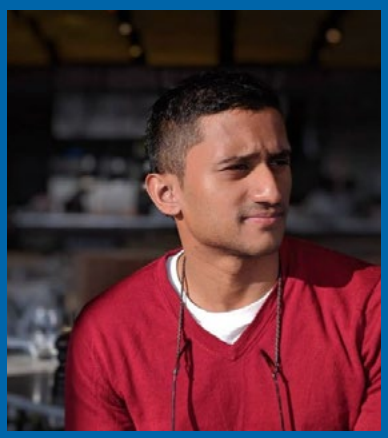
Conclusions

Smoking imposes a significant health and economic burden in Indonesia. The findings of this study stress the importance of developing effective tobacco control strategies, which would benefit the country both in terms of health and wealth.

Rav Sellahewa

Liquid Biopsies in Pancreatic Cancer

Supervisor Names and Institute Affiliations:
Mr Daniel Croagh, Department of HPB Surgery, Monash Health
Professor Brendan Jenkins, CiiiD, Hudson Institute of Medical Research



After finishing fourth year I decided to do a BMedSc(Hons). I had always been interested in research and I thought it would be a good way to learn more about research and take a break from clinical medicine. I was fortunate enough to undertake a laboratory-translational project at Monash Health. I started the year feeling completely out of my depth and was constantly faced with new issues and obstacles every day. However, looking back these frustrating experiences enabled me to grow and develop. You really feel responsible for your project, and it's incredibly rewarding to see the end product from all your hard work. I am very grateful to my supervisors for supporting me but also giving me space to grow and helping make the year enjoyable.

I would highly recommend undertaking a BMedSc(Hons) and would be happy to be contacted- **rpsel2@student.monash.edu**

ABSTRACT

Background

Pancreatic cancer has a poor five-year survival rate of 9%. In order to improve this overall survival, we need better investigations that can enable early diagnosis, better prognostication and monitoring of disseminated and residual disease. Further, these tests would have to be accurate, minimally invasive and cost-effective to decease the burden of cancer.

Aim

This study aims to establish the utility of circulating tumour DNA as a test to help in the diagnosis and prognostication of patients with pancreatic cancer.

Method

Patients who underwent an EUS-FNA for the investigation of solid pancreatic masses or underwent resections for pancreatic cancer at Monash Health between January 2015 and January 2019 had their plasma stored in the Victorian Pancreatic Cancer Biobank (VPCB). These plasma samples were then removed from the biobank and the cell-free DNA component was extracted. The cell-free DNA was then analysed using droplet digital PCR looking for KRAS G12/13 mutations commonly found in pancreatic cancer. In the validation cohort 25 plasma samples from patients with pancreatic cancer were analysed. In the final cohort 59 patients with pancreatic cancer and 14 patients with benign pancreatic disease were analysed. These results were then compared against the patient's diagnosis, stage of disease, tumour size, tumour location, CA19-9, Tissue KRAS results and survival.

Results

Circulating tumour DNA (ctDNA) G12/13 plasma mutations were detected in 66% of patients and 76% of patients with G12/13 mutations in their tissue. Concordance was 100% with tissue. Circulating tumour DNA corresponded with stage and tumour size. High ctDNA was associated with a significantly worse prognosis. Patients with a high ctDNA, MAF>0.10%, had a median overall survival of 155 days compared to 560 days for patients with a MAF<0.10% ($p<0.001$). Patients with operable disease and a high ctDNA, MAF >0.10%, had a median survival of 193.5 days compared to 762 days for patients with a MAF<0.10% ($p=0.015$).

Conclusion

Circulating tumour DNA is a useful test to aid in the diagnosis and prognostication of patients with pancreatic cancer. Through continuing to investigate the utility of circulating tumour DNA there is the potential to apply it in clinical practice to optimize the care and survival outcomes of patients with pancreatic cancer.

Sachintha Senarath

Predicting pregnancy outcomes using staff engagement and patient experience survey data

Supervisor Names and Institute Affiliations:
Professor Euan Wallace[1,2], Ms Robyn Hudson[2], Dr Mary-Ann Davey[1,2]
[1]Department of Obstetrics and Gynaecology, Monash University, Clayton
[2]Safer Care Victoria, Department of Health and Human Services, Melbourne

I completed fourth year in 2018 based at metropolitan hospitals after having done third year rurally in Gippsland. I wanted to do a BMedSc(Hons) in 2019 to round off my experiences by exposing myself to the world of research. Initially, I approached my to-be supervisors seeking a clinical project that combined my two areas of interest; O&G and cardiology. When this was not feasible, I was kindly offered an alternative project in the area of epidemiology and quality improvement, a field that I had never contemplated. This challenge, and the curiosity to learn more about it, motivated me to pursue it. I am glad I made this choice. This year has been refreshing, fascinating and rewarding. The opportunity to undertake my research at Safer Care Victoria, the state's lead agency for healthcare quality improvement, exposed me to so many new things. Although initially overwhelming, my knowledge about statistical analysis, conducting a sound experiment, have also grown so much throughout the year. This critical thinking mindset, which I will always carry with me, has also changed my approach to clinical medicine. I would definitely recommend an Honours year to any prospective students.

I can be reached at
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with any questions.

ABSTRACT

Background

Current methods of monitoring healthcare quality and safety rely on retrospective measures such as mortality and complication rates, termed lagging indicators. Their major limitation is that changes to the system can only be made after harm has already occurred. An emerging concept is the use of measures with more predictive utility, leading indicators. These can be used to direct improvements in quality or safety before significant harm arises. Leading indicators have been successfully applied in non-healthcare industries and have shown some promise in certain areas of healthcare as well. However, they remain to be widely adopted in Australia. There is growing evidence that results of staff culture and patient experience surveys can be used as leading indicators of quality and safety. This information is routinely collected in the Victorian maternity care sector. However, their potential as leading indicators for pregnancy outcomes has never been investigated.

Aim

To assess the utility of staff engagement and patient experience survey data as leading indicators for pregnancy outcomes, in Victoria.

Method

This was a retrospective epidemiological study of capability level 4, 5 and 6 Victorian maternity services from 2016 to 2018. Data for six questions reflecting staff engagement were obtained from the Victorian hospital staff culture survey known as the People Matter Survey (PMS). Data for seven questions reflecting patient experiences of pregnancy care were obtained from the maternity module of the Victorian Health Experience Survey (VHES). Data for six pregnancy outcomes were obtained from the Consultative Council on Obstetric and Paediatric Mortality and Morbidity (CCOPMM). I performed Pearson's correlation tests between the rates of staff engagement, positive patient experiences and pregnancy outcomes to look for associations. Correlations (R) exceeding $\pm$0.4 were considered noteworthy.

Results

Firstly, there were strong positive correlations (i.e. disproves hypothesis) between rates of staff engagement and the outcome of low 5-minute Apgar scores in term newborns without congenital anomalies (R=0.820). Secondly, there were moderate negative correlations (i.e. supports hypothesis) between the rate of staff engagement and the outcome of formula use in hospital in term, breast-fed newborns without congenital anomalies (R=-0.462). The same outcome also had similar moderate negative correlations with the rate of patients who felt adequately supported by maternity staff about feeding their newborn (R=-0.427). Lastly, there were strong positive correlations (i.e. supports hypothesis) between rates of staff engagement and positive patient experience (R=0.627).

Conclusions

Overall, I did not identify as many strong or significant correlations to offer convincing evidence that staff engagement and patient experience data, as currently collected and reported, offer utility as leading indicators of quality and safety in Victorian maternity care. There were, however, some interesting associations, particularly in relation to low Apgar scores the formula use, that merit further inquiry with more rigorous studies. The quality of the data which limited my study also highlighted the current barriers to effectively utilising leading indicators to their fullest potential.

Sumudu Setunge

The relationship between the economic integration and mental health of resettled refugees in Australia: A Longitudinal cohort study.

Supervisor Names and Institute Affiliations:
Dr. Joanne Enticott and Professor Grant Russell
Department of General Practice

After finishing fourth year last year, I decided to undertake an honours research year. This was because I wanted a break from clinical medicine and also wanted the opportunity to gain a greater understanding of what conducting research actually looked like. I chose this area of research as I have always been interested in refugee and migrant health. This population isn't something we learnt about much in our medical degree so I felt I would also be able to expand on my medical knowledge in this area. I thoroughly enjoyed my honours year at the Department of General Practice. I learnt valuable new skills in conducting statistics, and learning to use a completely new program. Moreover, the year forged my understanding of what good quantitative research entailed and allowed me to apply that when reading other studies. Finally, I enjoyed conducting research in a vulnerable population and being able to contribute to understanding how they experience health. My advice to future students would be to pick an area that genuinely interested you and also to choose a project that you feel is manageable to complete within the time frame.

I am happy to be contacted by future students at **snset1@student.monash.edu**

ABSTRACT

Background

Australia and most western democracies are accepting an increasing number of refugees. Resettled refugees experience a higher prevalence of mental illness than host country populations. This disparity in mental illness has origins in the unique pre-migratory and post-migratory experience of refugees. Research, into post-migration factors, offers significant value by identifying possible targets for modifiable intervention. One of the major barriers to resettlement is the economic integration of refugees. Importantly, this is a known factor associated with mental illness in different populations. This study investigates whether factors associated with the economic integration of refugees in Australian society is related to their mental health.

Aim

To examine the association between mental illness and economic integration and investigate the progression and prevalence of mental illness in the resettled refugee population in Australia over a 5-year period.

Methods

This study analysed data on 2399 adult humanitarian migrants across four longitudinal annual waves between 2013 and 2018 from the Building a New Life in Australia survey. The self-reported Kessler psychological distress scale (K6) and the post-traumatic stress disorder-8 items (PTSD-8) measured the mental health outcomes. A K6 greater than a score of 19 represented a severe mental illness outcome and a positive PTSD-8 screen represented a positive post-traumatic stress disorder (PTSD) outcome. An aggregate of these measures further created a combined mental illness outcome. Generalised linear mixed models were used to investigate the repeated measures between the outcomes and economic integration variables, as well as other predictor variables.

Findings

The final models detected a significant association between the number of financial hardships and the mental illness outcomes. A dose-dependent association was demonstrated between increased number of financial hardships and an increased risk of severe mental illness (OR=1.9-3.9, 95% CI 1.2-9.3), PTSD (OR= 1.74-2.61 95% CI 1.15-5.91) and combined mental illness (OR= 1.82-3.25 95% CI 1.38-5.95). Finance stress was associated with severe mental illness (OR =1.64 95% CI 1.21-2.44). We failed to detect any significant association between employment and all outcomes. Severe mental illness and PTSD was significant with gender, Middle Eastern origin, fair and poor self-rated health, pre-migration traumatic experiences and loneliness. PTSD and combined mental illness further showed significant associations between ages 35-55. 10 Our results reported a high prevalence of mental illness in the refugee cohort during resettlement. The model adjusted prevalence at wave four was 8.6% (95% CI 6.81-10.30) for likelihood of severe mental illness, 16.5% (95% CI 14.18-18.90) for PTSD and 20.1% (95% CI 17.5-22.7) for combined mental illness. Our findings determined the prevalence of severe mental illness and combined mental illness remained stable over the 4 waves, while the prevalence of PTSD decreased ($p<0.001$).

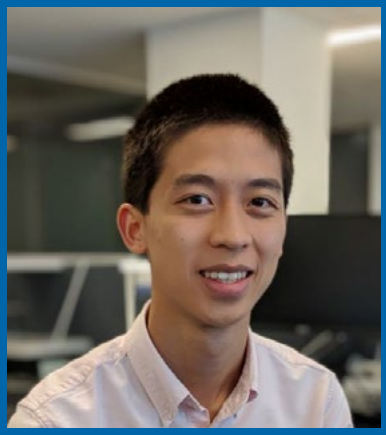
Conclusions

This is the first study to analyse economic integration and refugee mental illness in a large, representative sample of refugees across four longitudinal waves. These findings highlight the ongoing prevalence of mental illness in the refugee population throughout resettlement. These novel findings offer new avenues for intervention and policy development and emphasise the ongoing need for mental health services for resettled refugees.

Kevin Shi

Acute behavioural disturbances in paediatric health services

Supervisor Names and Institute Affiliations:
Simon S Craig[1,2]
Michael S Gordon[1,3]
1. School of Clinical Sciences at Monash Health, Monash University
2. Emergency Department, Monash Health
3. Early in Life Mental Health Service, Monash Health



Completing a BMedSc(Hons) has been a unique and rewarding experience. This year has offered me a new perspective into the value (and difficulty!) of clinical research and has strengthened my interest in future research opportunities and a career as a clinician-scientist. It's been a privilege and a challenge to be able to bring this research project all the way from an original research idea to ethics application and now a completed thesis. The work I've completed this year has given me a deeper insight into both paediatric emergency medicine and child/adolescent psychiatry, and I look forward to exploring these areas further in the years ahead. The flexibility of the Honours year has also given me the opportunity to make the most out of my role as MUMUS President - although balancing this with my research year was difficult at times, it's been a very rewarding experience being able to serve our Monash medical community. A big thanks to my supervisors, Profs Craig and Gordon, for their support, and to the team at the Department of Paediatrics office for many great memories and friendships this year. Congratulations to everyone on finishing their BMedSc(Hons) year!

ABSTRACT

Background

Acute behavioural disturbances (ABD), including aggression, agitation and self-harm, are a significant hazard in hospital environments. It is likely that important differences exist between children, adolescents and adults with ABD, and an urgent need to minimise the use of involuntary restraint, particularly in youth, has been identified. Despite this, the characteristics and outcomes of paediatric patients with behavioural disturbances are not well known, and there is national and international variation in how these behaviours are managed in clinical settings.

Objectives

To describe: 1) the incidence, time and location of acute behavioural disturbances in paediatric patients and hospital areas, 2) the demographics, social risk factors and mental health diagnoses in paediatric patients with behavioural disturbances, 3) the nature and current management of ABD in children and adolescents, and 4) the arrival and disposition of paediatric patients who demonstrate ABD in emergency departments.

Methods

Code Grey incidents were used as an indicator of acute behavioural disturbances. Clinical incident records from a large metropolitan health network were searched to identify Code Grey events in patients aged 0-17 years and/or in paediatric areas in 2017-18. Medical records of patients involved in Code Greys were reviewed and these were matched with mental health and emergency department records where available. Switchboard records were used to estimate the proportion of events not reported in the incident database.

Results

Records from 1851 Code Grey incidents were screened, from which 558 Code Grey events were identified across three hospital sites across the two year study period. Two-thirds of Code Greys occurred in the Emergency Department (ED) and more than half occurred after hours. Incidents in outpatient areas, incidents involving visitors and Code Black events were infrequently reported. There were 259 patients involved in Code Grey incidents with a median age of 16.3 years. Males and females were equally represented in the study population. The most common recorded mental health diagnoses in this group were depression, borderline personality disorder and anxiety, and 76 (29.3%) patients had at least one neurodevelopmental diagnosis. Over half of these patients reported a history of self-harm. Patient behaviours and use of restrictive interventions differed significantly between emergency departments, inpatient mental health and other inpatient paediatric areas. Although verbal de-escalation was frequently attempted, restrictive interventions were required in the majority of incidents. There was a significant variation in the medications used for sedation in different clinical areas. In the emergency department, patients receiving restrictive interventions were more likely to be admitted, and admission was significantly associated with increased ED length of stay. Most patients involved in Code Grey in the ED were transported to hospital by police and/or ambulance services.

Conclusion

Acute behavioural disturbances in children and adolescents were varied and occurred frequently across these paediatric health services. Further research is required to identify safe and effective management strategies to reduce the rate and severity of ABD in clinical areas. New models of care may also be required to reduce the demands of paediatric ABD on emergency services and departments.

Andrew Stainsby

Pulmonary Vascular Morphology in Experimental Diaphragmatic Hernia

Supervisor Names and Institute Affiliations:
Prof. Stuart Hooper – The Ritchie Centre
A. Prof. Ryan Hodges – Department of O&G, School of Clinical Sciences

After having no interest in research during the first few years of Medicine, I finally bit the bullet and went to a BMedSc(Hons) information night to see what all the fuss was about. I met some really passionate students who had very interesting projects that I wanted to do something similar to, so I applied to their supervisor. Honours has been a very rewarding year. It's completely changed the way I think about medicine and improved my ability to research new topics. I went into this year knowing almost nothing about my research topic but quickly became comfortable with it. My confidence and ability to communicate in both written and oral formats has skyrocketed, which I think is invaluable. My future advice to students is to have a go at figuring out things yourself before talking to your supervisor about any issues you encounter (not to say you shouldn't get their advice). Get on top of writing your thesis early as well!

Feel free to contact me at **avsta1@student.monash.edu** if you have any questions as well.

ABSTRACT

Background

Congenital diaphragmatic hernia (CDH) is a life-threatening condition resulting from incomplete closure of the diaphragm during fetal development. Infants with CDH have small lungs and frequently develop pulmonary hypertension due to abnormal pulmonary vascular development, although its precise cause is unknown. Current hypotheses implicate alterations in the biochemical pathways that regulate pulmonary vasodilation, as well as anatomical incapability for the lungs to accept a large volume of blood due to abnormal vascular development. However, traditional analytical techniques which have shown arterial development to be abnormal may not apply to CDH-affected lungs. Techniques usually compare arteries based on size; however, the smaller lungs in CDH also have smaller arteries. A more consistent method of comparison is based on arterial hierarchy, that is, how far high or low arteries are in the arterial tree. We aim to develop a technique which uses high-resolution X-ray imaging to analyse the entire pulmonary arterial tree. We then aim to apply this technique to the lungs of rabbits with a surgically induced diaphragmatic hernia (DH) and compare them to sham-operated control rabbits based on vascular hierarchy.

Method

Left-sided DHs were surgically induced in fetal rabbits at gestational day 23 (GD23; term GD31-32). After delivery via caesarean section at GD30, rabbits were euthanised. A contrast agent was then injected into the kittens' pulmonary arteries, and the lungs were preserved. Lung specimens from DH and sham-operated control kittens were imaged at the Australian Synchrotron and then reconstructed into three-dimensional (3D) images. Automated analysis of the pulmonary arterial trees was performed on these 3D images by customised and previously validated MATLAB computing software. We compared the left-sided pulmonary arteries of DH and control kittens based on vascular branching hierarchy.

Results

We analysed the left lungs of six rabbits (control: n=3; DH: n=3). Compared to controls, DH kittens had reduced pulmonary arterial volume and radius. We were also able to measure arterial number, length, branching angle, and tortuosity, which were not different between DH and control lungs, although this conclusion must be treated with caution due to low statistical power.

Conclusions

The most significant finding of this study is that arterial radius was significantly smaller in rabbits with a DH. We speculate that this is responsible for pulmonary hypertension observed in experimental models of DH. Our study was limited by small sample size and the processing capabilities of MATLAB. However, this analytical technique can be developed further to correlate findings with histology, estimate pulmonary vascular resistance, and analyse airways. Ultimately, we hope to use this technique to improve our understanding and treatment of infants with CDH.

Rebecca Stone

Evaluating the impact of pilot guidelines for earlier prolonged pregnancy monitoring of South Asian-born women

Supervisor Names and Institute Affiliations:
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I decided to do a BMedSc(Hons) year after my 4th year of medicine as a change of pace from the medical course. I felt it was the perfect way to deepen my understanding of research and how we can best practice evidence-based medicine. With this in mind, I was interested in a clinical project analysing a change in practice that was triggered by emerging evidence. This year has given me an appreciation of the huge amount of work involved in research, and how understanding and assessing it critically will enhance my future clinical practice. I've loved being exposed to different work environments and meeting new people this year. I'd like to thank my supervisors, friends, and family for the support they provided to me during a year that was full of learning.

I'm more than happy to be contacted by anybody with questions about my project or the benefits of a BMedSc(Hons) year:
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ABSTRACT

Background

Pregnant women South Asian ethnicity are at higher risk of stillbirth at term than other women. It is hypothesised that this is a result of accelerated fetoplacental maturation, and fetal compromise from placental dysfunction occurring at an earlier stage. To address this, Monash Health introduced a pilot guideline in July 2017 for earlier term surveillance of pregnancies of South Asian-born women from 39 weeks' gestation with twice weekly amniotic fluid index (AFI) and cardiotocography (CTG) to detect fetal compromise. Since its introduction, there has been a decrease in stillbirth rates in South Asian-born women, however the mechanism behind these improved rates is not understood.

Methods

A retrospective cohort study of two snapshot time periods of three months at Monash Health were taken from a larger three-year period of 2016-2018. The Monash Health pilot guidelines were introduced in July 2017. The first period pre-implementation of the guidelines (January-March 2016), and the second was post-implementation (October-December 2018). Data from singleton pregnancies ≥37 weeks' gestation of women from all regions of birth were collected: 2,061 women from the 2016 time period and 2,039 from the 2018 time period. Maternal characteristics, details of monitoring episodes, AFI and CTG results, birthing details, and neonatal outcomes were collected. The AFI and CTG results of South Asian-born women in the 2016 period were compared to those of the 2018 period. Monitoring results were compared between South Asian-born and Australia/New Zealand-born women.

Results

In the post-implementation period more South Asian-born women underwent monitoring ≥ 39 weeks (34% vs 75%, p<0.001). There were more abnormal AFIs detected at 39 weeks in South Asian-born women in the 2018 period than 2016 (3 vs 9, p=0.035), but no difference in abnormal CTGs. Under the pilot guidelines, a first AFI measurement of ≤8cm increased a woman's hazard of obstetric intervention than those with a normal AFI measurement (HR 4.4 95% CI 1.7-11.3). Comparing the 2018 subgroup to 2016, neonates of South Asian-born mothers ≥39 weeks had fewer admission to Special Care Nursery and Neonatal Intensive Care Unit (11.9% vs 17.7%, p=0.021) and fewer high cord lactate levels (2.9% vs 8.1%, p=0.013). For the overall cohort in 2018, there was an increase in inductions of labour compared to 2016 (39.9% vs 29.5%, p<0.001), but mode of birth did not change. South Asian-born women had rates of oligohydramnios at 40 weeks similar to Australian/New Zealand-born women's rates at 41 weeks.

Conclusion

Pilot guidelines for earlier term surveillance of South Asian-born women was associated with more abnormal AFI results being detected, a slight increase in obstetric intervention, and improvement in certain neonatal outcomes. A decrease in stillbirth at term for South Asian-born women may be a result of increased detection of fetal compromise with earlier surveillance.

Michelle Truong

Vestibular function following cochlear implantation

Supervisor Names and Institute Affiliations:
1. Associate Professor Debra Phyland, Department of Surgery, Faculty of Medicine, Nursing and Health Sciences, Monash University
2. Professor Stephen O'Leary, Department of Otolaryngology, The Royal Victorian Eye and Ear Hospital

I chose my project because I was very interested in ENT, specifically cochlear implant surgery and so was very lucky to complete my research year at the Royal Victorian Eye and Ear Hospital. Being an external hospital, it was quite daunting to start the year in an unfamiliar environment, but with the help of both my supervisors, I quickly adapted to my new surroundings and found it a great opportunity to gain some independence. My project was clinically based, and I really enjoyed the interacting with patients – something that I think will definitely help me in my final year of medicine as well! Some of the most rewarding experiences I gained from the year include learning how to write a scientific paper, understanding how to use different statistical programs, and also working in a multidisciplinary team. For future BMedSc(Hons) students, I encourage them to start early so that they can have ample time to recruit patients and also to read widely in their area of research to understand where their study will sit in the current literature.

I am more than happy to be contacted about any questions you might have!
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ABSTRACT

Background

Dizziness is a common peri-operative complication after cochlear implant (CI) surgery. Currently, its aetiology is poorly understood. Previous studies have suggested that semi-circular canal function is not significantly affected in the early post-operative period, which suggests that the cause of dizziness may be otolithic in origin, either utricle or saccule dysfunction. At the moment, it is difficult to assess saccular function in the short term due to a lack of available bedside tests. A possible solution may be to study utricular function instead, using non-invasive measures such as the Subjective Visual Vertical (SVV) test.

Method

We designed a prospective cohort study to look for evidence of otolith dysfunction and peri-operative dizziness after cochlear implant surgery. Patients were seen pre-operatively, one-day, one-week, and six-weeks after surgery. Before surgery, a pre-operative history was taken to assess whether patients had any pre-existing balance problems. At each follow-up time point, patients were asked whether they had experienced any new onset dizziness that was different to their pre-operative baseline. If new symptoms were present, a diagnostic algorithm was used to classify the symptoms into differential diagnoses based on the quality and pattern of dizziness reports. At each time point, otolith function was also assessed using a validated version of the standard SVV test. Ten famous paintings were projected into a virtual reality headset at different starting angles, and patients were asked to align the images to their perceived vertical using a remote controller. Response angles were measured for each of these 10 paintings, and then compared with pre-operative values to see if there was a significant change from their baseline. SVV results were then compared to the presence or absence post-operative symptoms, looking for an association.

Results

Post-operatively, balance problems were reported in 33% of patients at one-day, 48% at one-week, and 26% at six-weeks after surgery. Using the diagnostic algorithm, most cases were classified as 'post-operative CI related dizziness', with unsteadiness being the most commonly reported symptom. Overall, SVV changes were reported in 82% of patients, with the majority of these patients showing SVV tilts towards the unoperated ear. We found a temporal association between SVV changes and subjective dizziness at one-week post-op, but not at one-day or six-weeks post-op.

Conclusions

Our results show that peri-operative dizziness is prevalent within the first week of surgery and mainly resolves by six-weeks. Otolith function can be affected after cochlear implant surgery, as evidenced by changes in the SVV. However, these changes were not associated with subjective dizziness throughout the entire follow-up period, suggesting that other factors aside from otolith dysfunction may be involved in affecting patients' perceptions of balance

Evelyn Turek

HIV, STIs and sexual practices among male sex workers in Melbourne

Supervisor Names and Institute Affiliations:
A/Professor Eric Chow, Professor Christopher Fairley
Melbourne Sexual Health Centre, Alfred Health, Central Clinical School

I was lucky enough to complete my BMedSc(Hons) at the Melbourne Sexual Health Centre under the supervision of Eric Chow and Christopher Fairley. My interests in medicine are quite broad, but when selecting a project I knew I was looking for something that was clinical or in the field of public health. I have since discovered that sexual health is an incredibly interesting area of research. STI rates are currently at their highest level in 30 years in most of the industrialised world, and it has been so interesting to learn how researchers are attempting to better understand and address these rapidly rising rates. My year actually involved two small projects looking at HIV/STIs among sex workers. One of my projects identified an ineffective an inefficient component of STI screening for sex workers, and has since helped guide a change in screening protocols at the clinic. I highly recommend completing a BMedSc(Hons) at MSHC. Eric and Kit are wonderful supervisors who will have your interests at heart and support you throughout the year. This year has taught me the importance and power of research, and the skills I have learnt will help me for years to come.

ABSTRACT

Background

There are limited data on HIV/STI prevalence and sexual practices among male sex workers (MSW) both globally, and in Australia. Past studies suggest that MSW are a unique group at high-risk of HIV/STIs. This study aimed to explore HIV/STI positivity, sexual practices and risk-behaviours among male sex workers attending a sexual health clinic in Melbourne.

Methods

We analysed computerised medical records of all first-visit consultations with males who self-identified as current sex workers, attending the Melbourne Sexual Health Centre (MSHC) between 2010 and 2018. Demographic data, sexual behaviour data and laboratory results for HIV, syphilis, chlamydia and gonorrhoea were collected as part of routine clinical care at MSHC.

Results

Of the 222 first-consultations with current male sex workers at MSHC between 2010 and 2018, the median age was 27 years (IQR 23 to 31). The positivity for HIV was 1.5% (95%CI 0.03 to 0.43%), syphilis was 6.5% (95% CI 3.4 to 11.1%), chlamydia was 10.2% (6.5 to 15.2%) and gonorrhoea was 10.3% (95% 4.2 to 20.1%). 32% and 60% of MSW reported having condomless anal and oral sex respectively with a client since their last STI screening. Most (80%) MSW had non-commercial sexual partners outside of work including 57% with male partners only, 30% with female partners only and 13% with both. Only 50% used condoms consistently with non-commercial sexual partners regardless of sex, and 9% reported intravenous drug use in the past 12 months.

Conclusion

MSW attending a sexual health clinic in Melbourne have a relatively high HIV/STI positivity and high proportion of condomless sex with clients and non-commercial sexual partners.

Safe sex messages and education are required to increase condom use during sex work.

Regina Elaine Uli

Health and Productivity Burden of Coronary Heart Disease in Indonesia

Supervisor Names and Institute Affiliations:
Professor Danny Liew – School of Public Health and Preventive Medicine, Centre of Cardiovascular Research and Education in Therapeutics
Professor Dianna Magliano – School of Public Health and Preventive Medicine, Baker Heart and Diabetes Institute

Hi, I'm Regina and I am a fourth-year medical student from the University of Indonesia. I have chosen my project due to a prior interest in heart disease, especially in Indonesia, because of its increasing prevalence yet lack of data. Through this project, we were able to inform how big of an impact coronary heart disease actually is in Indonesia, specifically in terms of life years and its effect towards the economy. I also had the privilege of being taught by two of the most amazing supervisors, Professor Danny Liew and Professor Dianna Magliano, who have guided me since day one. I have learned so many things throughout my time here and this has enabled me to develop my research skills. Taking a step forward to accomplishing Honours year was a challenge, but is definitely worth the experience. My journey in Monash University is, no doubt, the highlight of 2019 and I am beyond grateful for that. So if you are considering on doing the Honours program, I suggest you do so!

Also, please feel free to contact me if you have any questions:
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ABSTRACT

Background

Globally, cardiovascular disease (especially coronary heart disease) is a major leading cause of mortality and morbidity. The burden is rising in low to middle-income countries. The impact of coronary heart disease on health and the healthcare system is well known, but its effect on work productivity at population level remains unknown, especially in Indonesia.

Aim

The aim of this study was to estimate the loss of productivity attributable to coronary heart disease in terms of years of life lost, quality-adjusted life years (QALYs) lost and productivity-adjusted life years (PALYs) lost.

Method

A life-table model was constructed to estimate the health and productivity of Indonesians currently aged 15 to 54 years (working age) with coronary heart disease. Follow up to 55 years was simulated. The life table analysis was then repeated assuming that the cohort did not have coronary heart disease, with resultant improvement in health and productivity. Differences in the results of the two analyses reflected the impact of coronary heart disease. Demographic and mortality data were based on the 2017 Global Burden of Disease study. Data on the prevalence of coronary heart disease were drawn from the 2018 Indonesian National Health Survey. Relative risk, productivity indices and utilities were based on published sources, as were healthcare costs per person per year (USD 5,720). The cost of each PALY was assumed to be equivalent to gross domestic product (GDP) per equivalent full-time (EFT) worker (USD 11,765). Future costs and years of life, QALYs and PALYs lived were discounted at an annual rate of 6%.

Results

At present, 1,954,543 (1.3%) Indonesian of working-age population have coronary heart disease. By the time all members of the cohort reached age 55 years, it was estimated that coronary heart disease resulted in 32,492 (36.6%) excess deaths, 86,855 (0.5%) years of life lost, 1,093,654 (6.2%) QALYs lost and 964,920 (6.3%) PALYs lost. The economic impact of lost productivity amounted to USD 11.4 billion, and healthcare costs to USD 110 billion. All estimates are discounted values.

Conclusions

The findings of this study provide an important and novel information on the burden of coronary heart disease in Indonesia. They inform investments in health promotion strategies to prevent and control coronary heart disease, which would lead to an improvement not only in the health of Indonesia, but also its wealth.

Julia Sabrina Vasthi

Are Sleep Spindles Associated with Neurocognitive Deficits in Children with Sleep-Disordered Breathing

Supervisor Names and Institute Affiliations:
Professor Rosemary Horne
Dr Lisa Walter
The Ritchie Centre, Department of Paediatrics, Monash University, and Hudson Institute of Medical Research

Hi, I'm Julia! a medical student from Universitas Indonesia, who was very privileged to have the opportunity in pursuing Honours year in Monash University this year (2019). I had a fantastic time doing such exceptional research topic, which was about sleep disorders in children. I learned that sleep, the very basic need in our life, turned out to be very critical, especially in children. Hence, I took this topic because what might look simple could turn out to be very vital to our life, and I was very lucky to be involved in this project and supported by wonderful supervisors, by experts and helpful staffs. I also learned how to analyse sleep and sleep spindles from electroencephalogram, and how to be a thoughtful and prudent researcher, especially when I had the opportunity to attend the weekly grand rounds and conferences. I encourage anyone with interest in research to pursue BMedSc(Hons) because the set of skills and knowledge gained are just priceless. And as the saying goes, 'Don't give up on your dreams, JUST KEEP SLEEPING'.

Happy to be contacted through:
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ABSTRACT

Background

Sleep is at lifetime maximum during childhood and is divided into two distinct states, Rapid Eye Movement (REM) Sleep and Non Rapid Eye Movement Sleep (NREM). NREM sleep is further divided into N1, N2, and N3 sleep. Sleep problems are common in children, one of the most common is sleep disordered breathing (SDB). Through polysomnography (PSG), SDB can be divided into three severities based on the number of obstructive apnoeas and hypopnoeas/hour of sleep (OAHI) score. All severities of SDB have been associated with neurocognitive dysfunction. OAHI is not predictive of neurocognitive outcome, a specific marker is neeeded and potentially this may be sleep spindles. Sleep spindles are waxing and waning oscillations in the electroencephalography (EEG) during N2 and N3 (NREM sleep) sleep, lasting for 0.5 – 3.0 s with the frequency of 11-16 Hz (slow spindles: 11-13 Hz ; fast spindles: 13.1-16Hz). The gold standard for identifying sleep spindles is manual detection, however is time consuming, therefore automated programs have been developed (HypnoLab), and has not been compared to manual scoring. To date, there have been no studies assessing spindle characteristics in children with all severities of SDB and relating them to neurocognitive outcomes.

Method

This study analysed previously collected data from 3-12 year old children who underwent overnight PSG, specifically looking at the EEG and assessing SDB severity using the OAHI. All children performed neurocognitive function tests. Aim One was to validate the HypnoLab for scoring sleep spindles against manual scored spindles. Automated analysis was done in HypnoLab, while the manual validation was using Profusion software of four children with all SDB severities. Aim Two was to compare spindle characteristics in children with all severities of SDB. Manual detection was performed in five subjects which were chosen randomly and re- analysed blindly to see the concordance with the previous study. Due to inter-observer variability, aim two used the re-scored data from my study. Aim Three was to detect whether there is an association between spindle characteristics and neurocognitive outcome. To do this, I compared the IQ results of five subjects with their spindle characteristics.

Results

Aim One: HypnoLab detected more spindles than manual detection. Most of the 'spin' events detected by HypnoLab were confirmed as not spindles as these events did not fulfil spindle criteria. Aim Two: There was inter-observer variability with my study consistently detect more spindles and spindles between two studies were mostly had unmatched spindle epoch and start time (Control: 56.22%; PS 1: 58.82%; PS 2: 77.59%; Mild OSA: 70.85%; MS OSA: 53.60%). No association between OAHI and spindle characteristics were found in my data. Aim Three: The five subjects with all SDB severities showed no pattern with the lowest IQ being found in children with both the lowest spindle density and highest spindle density (normal IQ: 90-109).

Conclusions

In conclusions, Hypnolab was not able to detect sleep spindles accurately. A large sample size is required to overcome inter-subject variability in manual detection. Lastly, we could not draw conclusions regarding sleep spindle characteristics and neurocognitive.

Miki Ann Wada

Artificial intelligence systems for diagnosing hypopigmented skin cancers: How does the technology compare?

Supervisor Names and Institute Affiliations:
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[1]School of Public Health and Preventive Medicine, Monash University, Melbourne, VIC, Australia
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[3]Monash eResearch Centre, Monash University, Clayton, VIC, Australia
[4]Victorian Melanoma Service, Alfred Health, Melbourne, VIC, Australia

I was fortunate enough to undertake my BMedSc(Hons) with the School of Public Health and Preventive Medicine and the Victorian Melanoma Service, Alfred Health. I chose this project to gain greater exposure into melanoma research and to expand my knowledge surrounding the role of artificial intelligence in a healthcare setting. With no background in computer science, this year was certainly a huge learning curve. I've gained a range of highly transferrable skills that that I will continue to cherish and look forward to building upon throughout my career as a student and physician.
My supervisors A/Prof Victoria Mar, Prof Rory Wolfe, Dr Stephen Gilmore and Dr Zongyuan Ge have provided me with invaluable opportunities to involve myself in research beyond the scope of my project. Having a supportive and passionate team is possibly the most important part of the year, and I was so incredibly lucky to have such great supervisors. I would urge anybody considering to undertake a BMedSc(Hons) year to go for it. An Honours year is a fabulous opportunity to broaden your knowledge on a specific topic that interests you, and gain skills that take you beyond a standard medical degree.

ABSTRACT

Background

Skin cancer is the most common cancer in Australia. The incidence of melanoma alone is 54 per 100,000 population, more than 10-fold higher than the global average. Hypomelanotic and amelanotic melanoma are significantly more difficult to diagnose than pigmented melanoma. Therefore, they are generally more aggressive at time of diagnosis. It is important that dermatologists and general practitioners alike can be confident in diagnosing these hypopigmented melanoma early. Research surrounding artificial intelligence (AI) systems for skin cancer diagnosis has ignited much excitement regarding automated diagnosis. Studies have demonstrated AI systems with performances on par with expert dermatologists for skin cancer diagnosis3,4,5. However, majority of the research surrounds pigmented skin cancers, not hypopigmented skin cancers.

Aim

The primary aim was to determine the best performing AI algorithm for a binary benign versus malignant classification task on the entire skin lesion image dataset (hypopigmented and pigmented). Secondary aims included comparison of algorithm performance for benign or malignant classification of hypopigmented lesions compared to pigmented lesion, and melanocytic hypopigmented compared to non-melanocytic hypopigmented lesions.

Methods

An image dataset of 1,077 skin lesion images were used to train and test three AI algorithms – two convolutional neural network classifiers (CNN-c1, CNN-c2) and one CNN autoencoder coupled to a support vector machine (autoencoder+SVM). CNN-c1 and autoencoder+SVM were developed from scratch. CNN-c2 uses Google's Inception v4 architecture. It is more intricate than the other algorithms as it has more layers and uses of transfer learning, a technique that has been shown to improve AI algorithm performance.

Results

CNN-c2 achieved the best performance for all classification tasks. For the primary outcome, CNN-c2 achieved an AUC of 0.837. CNN-c1 and autoencoder+SVM achieved 0.669 and 0.644 respectively. Benign and malignant classification of pigmented lesions was superior to hypopigmented lesions for all algorithms. Additionally, classification melanocytic hypopigmented skin lesions as benign or malignant with greater success compared with non-melanocytic hypopigmented lesions.

Conclusions

This study presents an early exploration into the use of AI systems for skin cancer diagnosis, specifically hypopigmented skin cancers. Given the limited quality of the image dataset use for this study, it is surprising that CNN-c2 was able to achieve results comparable to existing studies in the literature. It is vital that clinicians and researchers alike familiarise themselves with these new concepts. Although the exploration of AI systems in healthcare is certainly still in its infancy, there is a lot of promise that such systems are likely to become part of routine patient care in the not too distant future.

Dorothy Wang

Severe Infection Risk in a Real-World Rheumatoid Arthritis Cohort: Incidence and Associations

Supervisor Names and Institute Affiliations:
Professor Michelle Leech[1,2], Dr Claire Dendle[1,3], Dr Ai Li Yeo[1,2,3]
[1]Centre for Inflammatory Diseases, School of Clinical Sciences, Monash University
[2]Department of Rheumatology, Monash Health
[3]Monash Infectious Diseases, Monash Health

I chose to undertake a BMedSc(Hons) after my fourth year of medicine and I'm extremely glad that I did. Having ownership over a project gave me the opportunity and context to understand research at a much deeper level. I'm grateful for the invaluable skills I gained from designing my project, recruiting patients, analysing stats, as well as resilience and problem solving when things invariably didn't go to plan. By far the biggest highlight of the year was working with three incredible supervisors, who were sources of never-ending support and guidance throughout the year. I'm also extremely grateful for the opportunities presented to me during my honours year to present my research, and the wonderful patients, doctors and researchers I've met who have all inspired me to continue pursuing research in the future.
To any future students, best of luck!

If you have any questions, feel free to email me at **djwan3@student.monash.edu**

ABSTRACT

Background

Patients with rheumatoid arthritis (RA) have a higher baseline infection risk compared with general population, due to inherent immunological dysfunction, immunosuppressive medications, and coexisting comorbidities. Infections are a leading cause of mortality in RA and remain an ongoing concern for patients and practitioners.

Aims

To investigate the incidence of severe infections in a real-world RA cohort, identify the factors most associated with infection risk, and use these to characterise a high-risk cohort.

Method

Patients were recruited consecutively from a tertiary hospital's RA clinic between January 2019 to July 2019. We included all consenting patients with a diagnosis of RA meeting the American College of Rheumatology/ European League Against Rheumatism classification criteria. The primary outcome of the study was a severe infection between January 2018 and July 2019, defined as any infection requiring hospital admission. We obtained a baseline infection history to establish the number of severe infections in the study period. Episodes were verified using hospital discharge summaries. We obtained demographic information and a medical history from scanned medical records. We used validated scores, such as the disease activity score of 28 joints (DAS-28) and the Charlson comorbidity index to evaluate disease activity and comorbidity burden respectively. For statistical analysis, we used Mann-Whitney U tests, Chi-squared tests and logistic regression to identify the factors most associated with severe infection.

Results

We recruited 263 eligible patients. The study cohort had a mean age of 59 years. 73% of patients were female, and 38% were receiving biologic therapy. Between January 2018 and July 2019, 45 severe infection episodes occurred in 34 patients (13%). Two deaths occurred from infection. The most common infection sites were the respiratory tract (53%) and urinary tract (13%). At the time of the severe infection, 40% were on steroids and 40% were on biologics. On multivariable analysis, the most significant risk factors for severe infection were having a low lymphocyte count (odds ratio (OR) 4.08), a previous infection within the last three years (OR 3.58), a Charlson comorbidity index of two or more (OR 2.69), and having higher disease activity (OR 1.35 per 0.5-increase). This multivariable model had an area under receiver operating characteristic (ROC) curve of 0.82. In this study, glucocorticoid or biologic use, and other immune biomarkers were not significantly associated with severe infection.

Conclusions

To our knowledge, this was the first Australian study to evaluate severe infection rates in a typical RA cohort. Infection rates in our cohort remained high, and comparable to previous studies. Identifying the strongest risk factors associated with severe infection has helped to characterise a high-risk cohort, who can be more intensely targeted for risk reduction interventions, such as controlling disease activity and promoting vaccinations. The ROC curve suggests that our multivariable model has good predictive capacity for severe infection risk, and in the future, could be developed into a simple screening tool to identify high-risk patients. These results are a first step towards personalised risk reduction, to ultimately help prevent infection episodes, and reduce unnecessary infection-associated morbidity and mortality.

Venisa Wang

Bullying and Peer Victimisation in Children with Intellectual Disabilities

Supervisor Names and Institute Affiliations:
- A/Prof Glenn Melvin
- A/Prof Kylie Gray
- Department of Psychiatry
- School of Clinical Sciences
- Monash University

I chose to complete a BMedSc(Hons) after my fourth year of medicine. I wanted to do a project in child psychiatry because I had an encounter with a child who had autism in ED, and I was interested in getting to know more about this condition. After my fourth year, I was also very ready to take a break from medicine, change up the pace and give research a go after hearing so much about it from previous students. This year has been extremely rewarding. I have learnt valuable skills throughout this year, and my experiences have made me more independent, responsible and resilient.

I would highly recommend doing a BMedSc(Hons) to prospective students and I'm always happy to have a chat **(vhwan1)!**

ABSTRACT

Background

Bullying and peer victimisation are serious issues that can cause long-lasting impacts on a child's development and wellbeing. Research has shown that students with disability (SWD) are exposed to these adverse events more commonly than their typically developing (TD) peers. However, limited research has been conducted to explore specific associations that SWD, or students with intellectual disability (ID) in particular, may have with bullying or victimisation that is different to their TD peers. Furthermore, there is also a limited understanding about the efficacy of anti-bullying programs in this cohort. This gap in the literature may lead to the development of unspecific and ineffective interventions in this high-risk population.

Method

This study was divided into two components with mixed methodology. For the first component, a quantitative analysis was performed with questionnaires collected from 629 parents and 314 teachers of students with ID. School attendance data was collected from schools. Multiple regressions were performed to investigate correlates of victimisation and to identify the association between victimisation and school attendance. The second component was qualitative, which involved semi-structured interviews with ten principals or senior staff members from special schools. The transcripts were loaded onto NVivo, and a thematic analysis was performed.

Results

Analyses revealed several significant correlates of victimisation across multiple levels of Bronfenbrenner's Ecological System's theory. Individual-level correlates included presence of ASD, level of adaptive skill and exhibition of emotional and behavioural disorders. Microsystem-level correlates included the school climate, the type of school and presence of family financial hardship. A mesosystem-level correlate was parent-teacher relationship. School attendance was found to be not associated with victimization. Participants of the interview identified that using 'bullying' to describe the inappropriate behaviours that their students displayed were often inaccurate, with many suggesting that their students did not understand what bullying was. In terms of strategies employed, participants indicated that schools adopted a proactive approach through teaching students positive behaviours and supplemented it with reactive strategies such as restorative conversations when bullying did arise. Barriers to successful implementation of strategies were also raised, which included parent, teacher and student factors.

Conclusions

This study has confirmed existing correlates as well as identified new associations of bullying and victimisation in students with ID, which could present as future areas of prevention and intervention. An understanding of anti-bullying programs in special schools was gained. The challenges and barriers outlined by participants could advise other special schools how to successfully approach these issues in their schools, as well as prompt the development of more targeted strategies against bullying and victimisation.

Ucca Ratulangi Widitha

A Combined Loop-Mediated Isothermal Amplification and Interdigitated Electrode Platform to Detect HLA-B*15:02 for Prevention of Carbamazepine-induced Stevens-Johnson Syndrome in People of Asian Ancestry: Towards a Point-of-Care Diagnostic Device

Supervisor Names and Institute Affiliations:
Prof. Patrick Kwan
Dr. Jianxiong Chan
Department of Neuroscience, Central Clinical School, Alfred Centre

When I found Patrick's page, he was basically asking "Do you want to develop a device that can potentially save millions of lives?". Since medical technology has always been a topic of interest for me, I was like, "WHEN DO I START?". Thus, he took me in. The first few months was quite challenging as this project integrates molecular biology and biomedical engineering, two fields I know nothing about. Fortunately, the Kwan group is very supportive: JX, Sher, and Asanka patiently guided me through. Optimising the first protocol, LAMP, took me almost the whole Honours year. We didn't even have time to completely optimise the second protocol—providing opportunities for future Honours or PhD students (could be you!). This experience heightened my appreciation of translational research; where researchers keep innovating for the greater good, knowing it may never work. Now, when I am finally able to grasp the wholeness of my project and become addicted to the process, Honours have come to an end. All in all, I highly recommend enrolling in BMedSc(Hons).

ABSTRACT

Background

The potentially fatal Carbamazepine-induced Stevens-Johnson syndrome and Toxic Epidermal Necrolysis (CBZ-SJS/TEN), can be prevented with the screening of a highly associated predictive marker, the HLA-B*15:02 allele, in high risk Asian-descent populations. However, current genetic screening modalities are deemed too expensive with long turnaround time, hampering the adoption of pre-treatment screening. Therefore, development of a cost- and time-efficient HLA screening test can overcome this hindrance. By integrating two novel and potential point-of-care methods, the Loop-Mediated Isothermal Amplification (LAMP) and Interdigitated Electrode (IDE) sensor method, we aimed to develop a platform that specifically detects HLA-B*15:02 exon 3—the most polymorphic exon alongside exon 2—directly from crude blood.

Methods

Six blood (three HLA-B*15:02 positive and three negative) samples collected from people with epilepsy were used for this study. The blood samples were combined with LAMP reagents and heated following a set of LAMP conditions, modified until an optimal result was achieved. A LAMP blood panel was created using the optimised LAMP condition; products of the blood panel were confirmed using SYBR green and gel electrophoresis before tested on the IDE sensor. After functionalisation of the sensors, an HLA-B*15:02 exon 3-specific probe was designed and embedded to the sensor surface, allowing the known-HLA-B*15:02-positive LAMP products to bind and cause a change in impedance. The measured impedance changes were then compared, hypothesising that positive samples have higher impedance change values.

Results

Using the optimised LAMP condition, isolation and amplification of the HLA-B*15:02-positive samples were achieved within 60 minutes without the need of prior DNA extraction. Moreover, the IDE sensor measurement resulted in generally higher impedance change in the positive samples (10.67% ± 6.54% SEM; n=3) as opposed to the negative samples (5.03% ± 3.14% SEM; n=3), although the difference was not statistically significant (p=0.3400).

Conclusions

We have provided a proof-of-concept for the novel LAMP-IDE platform to detect HLA-B*15:02 exon 3. After validation with larger sample size this preliminary platform can be combined with a previously established LAMP-IDE platform for HLA-B*15:02 exon 2 detection, providing potential for translation into a lab-on-a-chip diagnostic device to be clinically implemented in CBZ-SJS/TEN high-risk populations.

Putu Ayu Widyastuti

Determining Predictors of Postpartum Relapse in Women with Multiple Sclerosis

Supervisor Names and Institute Affiliations:
Dr Vilija Jokubaitis and A/Prof Anneke van der Walt, Department of Neuroscience, Central Clinical School, Monash University

Hi, I am Yuwi. I am a fourth-year medical student from the University of Indonesia. Interested in the maternal and neonatal health-related project, but was not fond of doing lab work for my Honours year, I was thrilled to come across this project. Not to mention, I got the opportunity to learn about command-line programming using STATA for the first time. I must say, being able to work out a complicated line of codes is the best feeling you could ever ask for as a complete beginner. As future doctors, having data science as an additional skill is really promising. For instance, it can help us to evaluate the relevancy of case studies or clinical trials results, and determine which result should be incorporated into our clinical practice. Finally, all of these positive experiences were only possible with the guidance of a very passionate supervisor, without whom my Honours year would never be this enjoyable. For future students, you will be amazed by your own learning curve throughout the Honours year. However, make sure to choose a project that is of your interest.

Feel free to contact me at
ayuwidyastuti17@gmail.com
if you have any questions!

ABSTRACT

Background

Clinical onset of multiple sclerosis (MS) typically occurs during childbearing age (20–40 years old), with Relapsing-remitting MS (RRMS) as the most common MS phenotype. Previous studies have shown that the relapse rate decreased as the pregnancy progressed. However, more than 10% of pregnancies in women with MS experienced an increased relapse rate during the postpartum period. Thus, postpartum relapse has become a concern during family planning, as there is a significant association between relapse and the long-term disability worsening of MS patients.

Method

A retrospective cohort study was conducted using pregnancy data between 2011–2019 derived from the MSBase Registry. Clustered logistic regression, Cox proportional hazard regressions, and Weibull regression models were created to predict the time to the first relapse during the three-months and the first-year postpartum period.

Results

Annualised Relapse Rate (ARR) has dropped to only 0.13±0.88 in the third trimester, then peak at 0.55±1.45 in the first three-months postpartum period. Two hundred and forty-eight (13.07%) pregnancies experienced at least one relapse within the first three-months postpartum period. Predictors of the higher hazard of postpartum relapse included: an EDSS score of ≥ 2 at conception ($_{adj}$HR=1.93, p=5.1×10-5), a higher relapse rate during pregnancy ($_{adj}$HR=1.30, p=4.4×10-4), and use of high-efficacy disease-modifying therapy (DMT) during the 1-year preconception period (adjHR=1.61, p=0.017). Higher rate of relapse during the prior year of pregnancy (HR=1.31, p=9.7×10-4), and longer duration of DMT use during pregnancy (HR=1.06, p=0.043) were associated with an increased risk of postpartum relapse on the univariable analyses; however, when adjusting for other measured covariates, the associations were no longer significant (p>0.05). Women aged >35 years old at conception (adjHR=0.63, p=0.015), and longer washout periods during the prior year of conception (adjHR=0.89, p=0.003) were protective against postpartum relapse risk. Also, terminated pregnancy was associated with a reduced postpartum risk of relapse relative to term pregnancy ($_{adj}$HR=0.02, p=2.6×10-5). In terms of the seasonal variation of postpartum relapse, women who were located in the southern hemisphere demonstrated a suggestive association with a lower risk of postpartum relapse on the univariable analysis (HR=0.63, 95%CI=0.43–0.92, p=0.017). Whereas, the sine (HR=0.90, 95%CI=0.74–1.08, p=0.269) and the cosine of the delivery date (HR=0.96, 95%CI=0.80–1.15, p=0.625) did not establish significant effects on postpartum relapse risk on the univariable analyses. In the cox model, we were also able to incorporate time-varying covariates, and here we additionally demonstrated that exposure to DMT during postpartum period (adjHR=0.42, p=0.001) was associated with a decreased risk of postpartum relapse; as well as women who breastfeed were 1.75 times less likely to have a relapse during the first three-months postpartum period (adjHR=0.57, p=0.017). Use of high-efficacy DMT after delivery was strongly suggestive of a reduced relapse risk by approximately 73% during the first three-months postpartum period relative to the low-efficacy group (adjHR=0.27, p=0.059)

Conclusions

Predictors of postpartum relapse identified may be utilized to stratify women at highest risk of postpartum relapse in order to implement management strategies that mitigate against these events, thereby aiming to prevent disability worsening.

Stevano Julio Wijoyo

Inhibitory Activity of Phenolic Compounds against Monoamine Oxidase Enzyme in Major Depressive Disorder Model

Supervisor Names and Institute Affiliations:
Supervisor: Dr Tom Karagiannis
Co-supervisore: Dr Simon Royce
Institute: Department of Diabetes, Central Clinical School

I completed my honours year in the Department of Diabetes, Central Clinical School as my double-degree program with Faculty of Medicine, Universitas Indonesia. I chose the project "Molecular mechanisms of action of dietary antioxidants and chromatin modifying compounds" with Dr Tom Karagiannis, which encompasses many small projects investigating effect of phenolic compounds in histone acetylation and deacetylation. It was a whole new subject for me, knowing that I only studied molecular biology for only a semester in my preclinical year. And gaining thorough understanding in epigenomic pathways for a short time is quite a challenge. Not to mention labour-intensive procedures that I have to master and done just to get a single data. However, this project offers me a different kind of fulfilment. It is not everyday that I can get to discover something new and eventually "pushing the boundaries of knowledge". It is so exciting once I gathered every single outcome from my experiments and how they fit perfectly like puzzle pieces. In the end, I feel very lucky to have this opportunity and feel very proud of the things I've been through, including the good and the bad.

ABSTRACT

Background

Despite of the advances in depression treatment, only 33% of patients receiving antidepressants achieve full remission. Whereas the rest shows only partial remission or no response at all. This is mainly caused by the heterogeneity of subtypes of depression that may be unmatched with the existing antidepressant agents. Therefore, ongoing research to discover novel antidepressant to solve this problem. One strong theory that still become the basis of depression treatment is monoamine hypothesis. Here, it speculates that decreased monoamine neurotransmitter in the brain causes depression. Monoamine Oxidase (MAO) Enzymes naturally breakdown monoamine neurotransmitter. Based on this fact, MAO is inhibited to prevent neurotransmitter breakdowns using MAO-Inhibitor. In a serendipitous finding, our phenolic compound is shown to inhibit LSD1, a protein serves in epigenetic modification and also have similar chemical structure with MAO. Therefore, investigation in LSD1 is interesting to be carried out to support the result found in MAO. Mediterranean Diet has been shown to prevent disease progression, including depression. Phenolic compounds contained within the diet is perceived to be able to inhibit MAO enzymes and therefore give the mood enhancing effect. Therefore, in this study, I investigated two variants of phenolic compounds, hydroxytyrosol or HT and hydroxytyrosol acetate or HTS.

Method

To measure inhibition rate of each phenolic compounds towards MAO enzymes, direct compound MAO inhibition assays were carried out. Followed by an in vitro experiment using T98G human glioblastoma cell. MDD environment were established by treatment with various MAO-stimulant and then phenolic compounds incubation is done to investigate its potency to reduce MAO in in vitro settings. Samples were collected and analysed using western blot analyses to gain MAO-A and -B expression of each treatment group. Additionally, western blot analyses were done to detect methylation status of H3K4me2 and H3K9me2. Both methylation status measures LSD1 activity.

Results

HT and HTS shown more affinity towards MAO-A (IC50 HT = 0.6951, IC50 HTS = 0.7243), stronger than TCP (IC50 = 0.9881). HT and HTS also shows irreversible and selective inhibition towards MAO-A. In in vitro experiment using T98G cells, HT and HTS decreases MAO-A expression from its upregulated condition, however combination of HT with DEX and HTS with DEX shown even lower MAO-A expression and nearly reached basal expression of MAO-A. In neuronal cells, HT and HTS treatment show a decrease in MAO-B expression even lower than its basal MAO-B expression. Combination of RA with HT and RA with HTS also shows lower MAO-B expression than treatment with HT and HTS alone. LSD1 activity is shown to greatly decreased in treatment with DEX and HTS, as shown in the high methylation status of H3K9me2, which indicates LSD1 is in its dormant condition.

Conclusions

HT and HTS selectively inhibits MAO-A as demonstrated through binding assays and activity assays. It may be significant finding because it might prevent side effects of MAO-B inhibition. The founding was supported by HT and HTS potency in inhibiting LSD1, a structural homolog of MAO enzymes, as shown by its low demethylation status in H3K9.

Jamin Wu

Generative Adversarial Networks for Simulated Prosthetic Vision

Supervisor Names and Institute Affiliations:
Supervisor: Dr Yan Wong[1,2]
Co-Supervisor: Dr Nicholas Price[1]
[1] Department of Electrical and Computer Systems Engineering
[2] Department of Physiology

I chose to do a BMedSc(Hons) between my fourth and fifth years of medicine. I have a personal interest in computer science and was lucky to conduct a project which was heavily focused on applying programming skills within a biomedical engineering context. The BMedSc(Hons) year was a humbling experience, and I learnt a great deal about what research entails. I admired the incredible persistence, resilience and precision of the research staff and students I met and I hope this year has brought me a little closer to those ideals. I am thankful I had this opportunity and very grateful for what my colleagues have taught me. One lesson I have learnt is to honour the small triumphs of incremental steps in any direction; worry too much about the destination, and you will find yourself standing still endlessly fretting about where to go!

ABSTRACT

Background

Cortical visual prostheses are emerging devices which are implanted on the brain to restore visual sensations to blind people. These prostheses are currently only expected to produce a limited number of small spots of light in the visual fields known as phosphenes, often likened to “stars in a night’s sky”. Phosphenes, however, tend to be irregularly distributed and display different visual properties between people. It is therefore not clear how phosphenes can be assembled and tailored for people’s different visual percepts to convey useful information. Other image processing domains have experienced success with image generation tasks using generative adversarial networks, a machine learning technique often used to assemble pixels into novel imagery. However, generative adversarial networks have not previously been applied to prosthetic vision to assemble phosphenes for arbitrary visual properties.

Aims

We aimed to determine whether generative adversarial networks could be used to generate phosphene patterns for different simulations of prosthetic vision, and whether these generated phosphene patterns were useful to people when applied to a digit representation task.

Methods

We developed a prototype software implementation of a generative adversarial network training architecture and a dynamic phosphene simulator using the Python programming language. We used the phosphene simulator to generate phosphene grids with different visual properties, and ran these grids through the generative adversarial network training architecture to produce phosphene patterns representing single digits, which were qualitatively analysed. We then recruited 11 participants for a psychophysics experiment comparing their ability to learn and recognise digits using the generated phosphene patterns versus patterns produced by a simple mask-based control.

Results

The prototype implementation we developed was successfully able to produce phosphene patterns for phosphene grids with varying resolution, spatial distribution and sizes of phosphenes. Qualitatively, the generated phosphene patterns were recognisable as digits at higher phosphene grid resolutions, but not at lower resolutions. Despite this, the experimental results demonstrated that people achieved better digit recognition accuracy overall using the generated phosphene patterns versus the mask-based control. While participants did not initially achieve better digit recognition accuracy, participants’ accuracy increased faster when learning the generated phosphene patterns versus control.

Conclusions

We demonstrated that a generative adversarial network training architecture can be applied to generate phosphene patterns tailored for different phosphene grids. However, our early implementation was not robust for low-resolution grids. Experimentally, it appears that although low-resolution generated phosphene patterns were not immediately recognisable, they may still be useful to increase the discriminability between digits when learned. As the first attempt at using generative adversarial networks to address the perceptual limitations of phosphenes, our work highlights potential targets for further improving how phosphenes are assembled for different simulations of prosthetic vision. Further work should aim at improving robustness of the prototype architecture for low-resolution phosphene grids and quantifying the intrinsic ability of low-resolution grids to represent visual information.

Vicky Xu

ESPRIT: Emergency caesarean Sections and recurrent spontaneous Preterm Birth

Supervisor Names and Institute Affiliations:
Main supervisor: Professor Andrew Shennan – King's College London and St Thomas' Hospital
Co-supervisor: Professor Shaun Brennecke – University of Melbourne and Royal Women's Hospital

Hi, I'm Vicky! I was in fourth year before my BMedSc(Hons) and will be entering my final year in 2020. I'm from New Zealand, where many young kiwis go on an "OE" – an "Overseas Experience". So I thought: why not make my OE my BMedSc(Hons) year? After over fifty cold emails, I arranged a project at St Thomas' Hospital in London, packed my bags, and braced myself for the infamous London weather. This project was an amazing opportunity and I'm so glad I took the risk. I have always been passionate about women's health, and a year focusing on the field really fostered my interest in O&G. Not only was I able to work with a clinical research team who were making huge strides in preterm birth, but I also got to live in London for a year and have the rest of Europe right at my doorstep! After months of data collection and anxiety over what my outcomes would be, it was extremely rewarding to see it all come together at the end. I'm very happy to be contacted by anyone interested in an overseas or O&G-related project!

My email is
vxxu2@student.monash.edu
or just message me on facebook.

ABSTRACT

Background

Emerging evidence has identified full dilatation emergency caesarean sections (FDCS) as a potential risk factor for subsequent spontaneous preterm birth (sPTB). The theorised aetiology behind this is trauma to the cervix during emergency caesarean section (EMCS) leading to cervical insufficiency. Though this aetiology is applicable to first-stage EMCSs (FS-EMCS), the risk of FS-EMCSs on subsequent sPTB is underexplored, as are the circumstances surrounding EMCSs that predispose women to recurrent sPTB.

Objectives

We aim to investigate the relationship between EMCS and recurrent sPTB, including clinical circumstances associated with EMCSs that may increase the risk of recurrent sPTB, and the effectiveness of current interventions for women with this risk factor.

Methods

This was a retrospective cohort study of women who had attended the high-risk preterm surveillance clinic at St Thomas' Hospital, London, United Kingdom. These women had a triad of pregnancies: an initial term pregnancy (Pregnancy A), followed by a preterm birth (Pregnancy B), and a subsequent index pregnancy with outcomes (Pregnancy C). Women were not necessarily nulliparous at Pregnancy A. Exposure was EMCS in Pregnancy A (FS-EMCS or FDCS); unexposed women delivered by any mode other than EMCS in Pregnancy A (spontaneous and operative vaginal delivery, elective caesarean section). Our primary outcome was sPTB <37 weeks (not including early miscarriages <14 weeks). Secondary outcomes included sPTB <34 weeks, <30 weeks, and <24 weeks; neonatal outcomes; effect of Pregnancy A EMCS cervical dilation; indications and complications of Pregnancy A EMCS on sPTB; strength of predictive tools for sPTB; and efficacy of transvaginal cerclages.

Results

Overall, 440 women were identified, including 92 exposed women and 348 unexposed women. 47.8% of exposed women had a sPTB <37 weeks compared to 27.1% of unexposed women. We found a significant increased risk of sPTB <37 weeks in exposed women compared to unexposed women (relative risk [RR] 1.76 [95% confidence interval, 1.33–2.32]). FDCS women had a two-fold increased risk of sPTB <37 weeks (RR 2.05 [95% confidence interval, 1.40–2.99]); FS-EMCS women had a RR of 1.64 (95% confidence interval [95%CI], 1.18–2.27). Perinatal mortality increased non-significantly in exposed women overall (RR 1.26 [95%CI, 0.80–1.98]) but was highest among FDCS women (RR 1.70 [95%CI, 1.21–2.38]). Risk of sPTB was greatest at 8-9cm cervical dilation for <34 weeks, <30 weeks, and <24 weeks (RR 2.04 [95%CI, 1.02–4.10]); RR 2.41 [95%CI, 1.20–4.87]); RR 2.53 [95%CI, 1.09–5.84], respectively). Malpresentation as indication for EMCS increased sPTB risk (RR 1.64 [95%CI, 1.05–2.54]). Complications at EMCS had no effect on sPTB rates (RR 0.94 [95%CI, 0.63–2.22]). All women who tested positive with combined predictive tools spontaneously delivered preterm (n=5). Transvaginal cerclages performed similarly in exposed women compared to unexposed women (RR 1.15 [95%CI, 0.67–1.96]).

Conclusions

Both FS-EMCS and FDCS increase the risk of recurrent sPTB and late-stage FS-EMCS may be of similar risk to FDCS. Current prophylactic interventions are appropriate to use in women with these exposures. We recommend that women with prior EMCSs should be closely monitored for sPTB in subsequent pregnancies.

Jia Zheng

The sexual wellbeing of young Australian women, aged 18-39 years

Supervisor Names and Institute Affiliations:
Professor Susan Davis
Professor Robin Bell
Doctor Rakib Islam
Women's Health Research Program, School of Public Health and Preventative Medicine

I chose to undertake a BMedSc(Hons) after completing fourth year as I have always had a strong interest in complementing my clinical work with research. After previously being involved in research regarding men with prostate cancer, I was enthusiastic to commence a project focussing exclusively on women's health. Female sexual function is a topic that was only briefly covered in our medical studies; yet, it is a fascinating area filled with controversy, disagreement and exciting new developments. Undertaking a project in epidemiology has taught me a vast spectrum of skills that has far exceeded my initial expectations. I have learnt how to conduct a comprehensive systematic review using multiple databases, as well as learn how to use statistical analysis programs. Throughout this year, I have also developed my ability to critically analyse research papers, whilst becoming more appreciative of the challenges involved in conducting methodologically robust research. This program has been incredibly rewarding both personally and intellectually, giving me valuable skills for the future.

ABSTRACT

Background

The female sexual response has been traditionally encapsulated in linear models, which act as the basis for the current classification systems for female sexual dysfunctions (FSDs). An FSD is low sexual function that is associated with sexually related personal distress. They include sexual desire, arousal, orgasm and sexual pain dysfunctions. A number of validated sexual function and sexual distress tools are available to measure domains of sexual function, as well as screen for FSDs. There is evidence of biological, psychological, interpersonal and sociocultural influences on sexual wellbeing. Sexual dysfunctions are not uncommon amongst premenopausal women; however, literature pertaining to the sexual wellbeing of Australian women of reproductive age has been sparse. In the research that has been conducted, there is limited use of validated sexual function questionnaires, distress measures and representative samples. A more comprehensive understanding of the proportion of young Australian women with an FSD will have broad implications for research, clinical practice and public education.

Aim

To describe the sexual wellbeing of Australian women aged 18-39 years using validated tools. Specifically, to document the prevalence of low sexual function, sexually related personal distress, and FSDs; describe the co-occurrence of FSDs; and describe the socio-demographic factors associated with FSDs.

Methods

A representative community-based sample of 6986 women, aged 18 to 39 years, from Victoria, New South Wales and Queensland participated in a cross-sectional online survey. All women completed the validated Profile of Female Sexual Function (PFSF) and the Female Sexual Distress Scale-Revised (FSDS-R). Women were classified as having an FSD if they reported low PFSF desire, arousal, orgasm, responsiveness or sexual self-image function, as well as a FSDS-R score equal to or greater than 11 out of 52.

Results

The prevalence of sexually related personal distress was 50.2% (95% confidence interval: 49.0-51.4). Sexually related personal distress without dysfunction was seen in 29.6%, whereas 20.6% had at least one FSD. In order of prevalence, the proportions of women with self-image, arousal, desire, orgasm and responsiveness dysfunction were 11.1%, 9%, 8%, 7.9% and 3.4% respectively. Co-occurrence of FSDs was common; almost half of the women with an FSD had two or more PFSF domains affected. Use of psychotropic medication was a risk factor for all FSDs ($p<0.001$) whereas Asian ethnicity was protective for all ($p<0.001$). Use of the oral contraceptive pill was not independently associated with any FSD.

Conclusions

Half of young Australian women have sexually related personal distress and one in five has at least one FSD. These high prevalences signal the importance of health professionals being adequately prepared to discuss sexual health concerns with young women.

Wendy Zhu

Regulation of type I interferon by GILZ in systemic lupus erythematosus

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Having completed fourth year, I knew I wanted a change of pace and to gain a better understanding of what research actually involves. I decided to do my project in Rheumatology and SLE as I already had an interest and thought this would be a very hands-on way to understand this specialty better. I also chose to do a lab-based project because I thought why not try something completely different and out of my comfort zone. I had no idea what my project would have in store for me, but it completely exceeded my expectations. I feel that I've learnt more this year than I have any other year of my course, and I have a much deeper understanding of what research involves. The skills that I have gained have also boosted my confidence and I am certain now that I will continue to do further research in my career. It has been such a fun and rewarding year, and I have made some great connections with my supervisors and the Morand Lab. I'd really recommend doing a BMedSc(Hons), because it's a great way to take that first step into research!

ABSTRACT

Background

Systemic lupus erythematosus (SLE) is an incurable, multisystem autoimmune disease. Often described as one of the 'great imitators' of medicine, its clinical presentation is heterogeneous and elusive, as is its pathogenesis. However, recent advancements in our knowledge have confirmed the pathological role of type I interferon (IFN-I). Despite this understanding, the cornerstone of management remains glucocorticoids (GCs). Their use in SLE, however, is controversial as they contribute to organ damage and cannot suppress IFN-I at the routinely prescribed doses. The need for a novel therapeutic is unquestionable, and one with a broad range of anti-inflammatory effects that includes suppressing IFN-I would be worthy of investigation. Glucocorticoid-induced leucine zipper (GILZ) is a potential candidate. GILZ is an anti-inflammatory protein potently induced by GCs. It mimics many of the immunosuppressive effects of GCs but also has some of its own. Importantly, early evidence suggests that it may not have the same detrimental adverse effects as GCs. Furthermore, GILZ deficiency has been demonstrated to contribute to a lupus-like autoimmunity in murine knockout models. Whether this involves IFN-I is suggested by unpublished data at the Morand Lab. Here, we aimed to assess whether GILZ can regulate IFN-I production or components of the IFN-I signalling pathway in SLE patients and confirm findings using a GILZ deficient murine plasmacytoid dendritic cell (pDC) model.

Methods

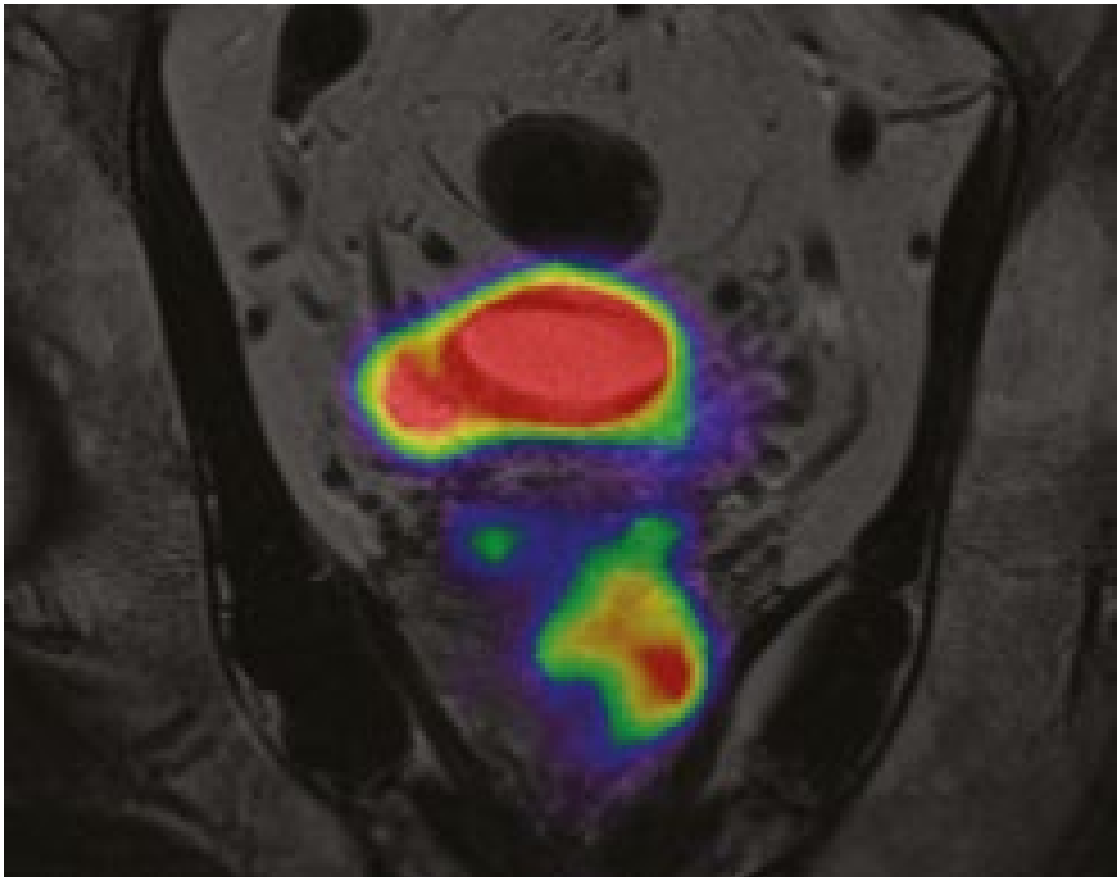
Six public gene expression datasets were analysed with a range of 62-1760 SLE patients. Within these, key components of IFN-I production and signalling pathway were examined against GILZ to determine if any correlations between the two existed. Clinical data were also analysed to assess the clinical relevance of GILZ. An in vitro study involving GILZ KO pDCs was then conducted to determine whether GILZ deficiency results in increased IFN-I production.

Results

Gilz was observed to be significantly positively correlated with Stat3 across all six datasets ($p < 0.01$) and significantly negatively correlated with Tlr7 in five out of six datasets ($p < 0.0001$). Gilz was also significantly negatively correlated with SLEDAI in SLE patients not receiving GCs in the largest dataset (GSE88884, $p = 0.02$). Furthermore, this dataset demonstrated that SLE patients with low complement (C3, C4) or high interferon status had significantly lower expression of Gilz compared to patients with normal complement ($p < 0.001$) or normal interferon status ($p < 0.0001$). However, in the murine model, GILZ deficient pDCs produced similar levels of IFN-I compared to pDCs with GILZ in vitro.

Conclusion

These findings demonstrate novel correlations between GILZ and key components of IFN-I production and its signalling pathway in SLE patients. This suggests that GILZ may be an important regulator of IFN-I in humans. However, a direct effect of GILZ on IFN-I could not be confirmed as GILZ deficiency did not lead to increased IFN-I production by murine pDCs. Nevertheless, this study suggests that GILZ may be clinically relevant as a novel therapeutic target for SLE.



Jeremy Cheng – PSMA PET/MRI of the Prostate Gland

68Ga-PSMA PET/MRI of the prostate gland demonstrating a focal area of increased radiotracer uptake corresponding to prostate cancer.

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