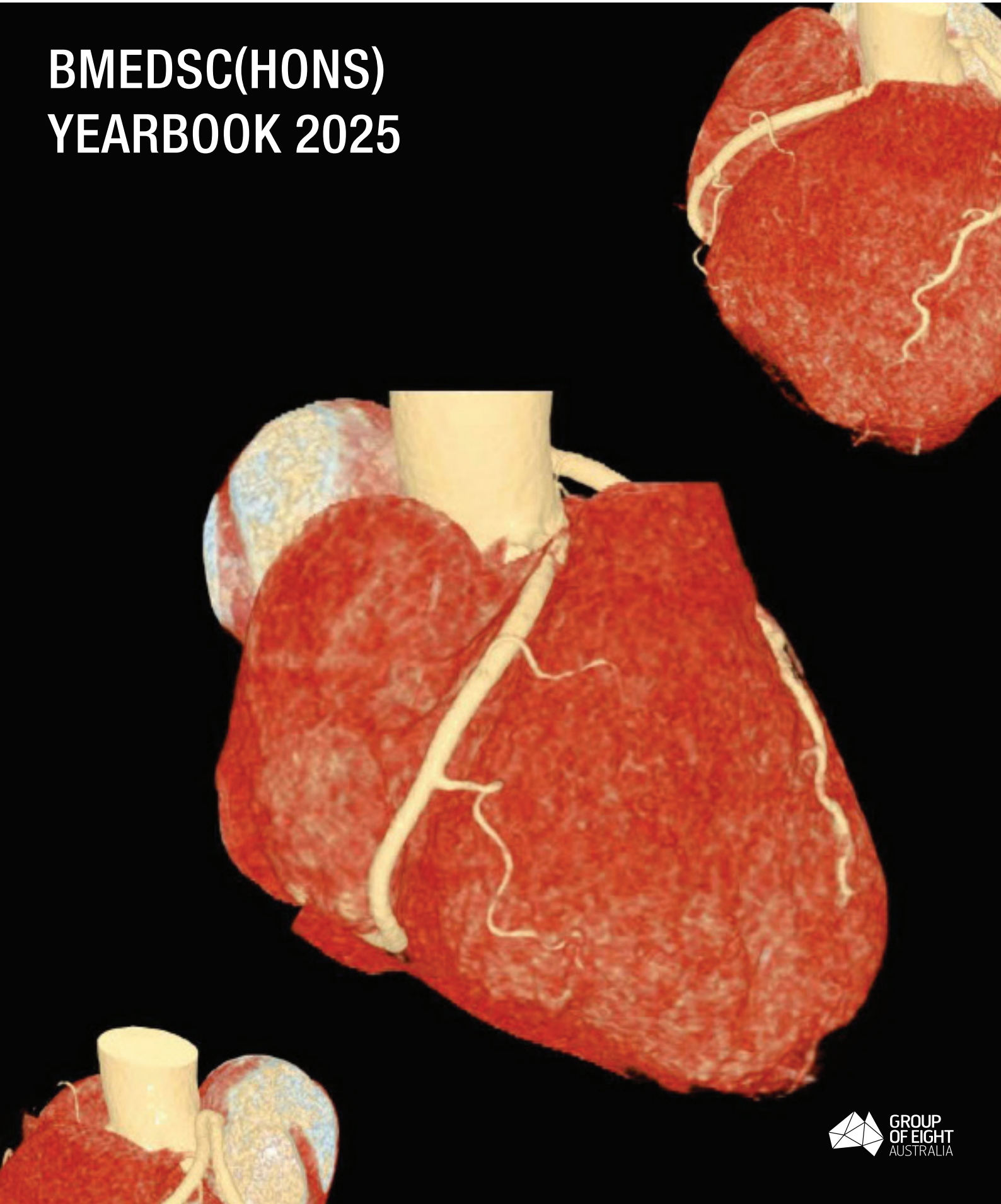




MONASH
University

MONASH
MEDICINE
NURSING AND
HEALTH SCIENCES

BMEDSC(HONS) YEARBOOK 2025



JACK STEWART AND RHEA NANDURKAR

RIVERS OF LIFE

IMAGE DESCRIPTION: COMPUTED TOMOGRAPHY CORONARY ANGIOGRAPHY REVEALS THE HEART'S VESSELS WITH REMARKABLE CLARITY. THESE 3D RENDERINGS SHOW THE RIGHT, LEFT ANTERIOR DESCENDING, AND LEFT CIRCUMFLEX ARTERIES, ALONG WITH THEIR BRANCHING VESSELS – THE ELABORATE PATHWAYS THAT SUSTAIN THE BEATING HEART.

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

Dear BMedSc(Hons) students, congratulations on completing your BMedSc(Hons) degree!

We are incredibly proud of what you've achieved. Completing a year of dedicated research is no small feat. You've stepped away from clinical training to immerse yourselves in the world of scientific inquiry, asking bold questions, navigating challenges, and contributing new knowledge to the field of medicine. That takes courage, resilience, and a deep commitment to making a difference.

We hope that this year has sharpened your critical thinking and research skills and also broadened your perspective on what it means to be a doctor and a scientist. Whether your future lies in clinical practice, research, or a combination of both, the insights and experiences you've gained will continue to shape your journey in profound ways.

We would also like to express our sincere thanks to your supervisors and to other members of their research teams who have devoted their time to support your learning during the year, and to the examiners who volunteered their time to assess Literature Reviews, Theses, School Oral Seminars, and Faculty Presentations. A particular thank you to Brenna Dempsey and to each of the School BMedSc(Hons) academic and support staff who do a huge amount of behind-the-scenes work during the year to ensure that the course runs smoothly. The Course would not be possible without them.

We would also like to thank your BMedSc(Hons) Student Representative Darren Tan for giving us feedback and supporting your interests during the year. The BMedSc(Hons) Course Management Committee and I, wish you all the very best for your return to clinical studies, and we hope to see and hear about your future research endeavours.

Warmest regards,

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

Message from the BMedSc(Hons) Student Representative

Congratulations to everyone on completing the BMedSc(Hons) course for 2025! For many of us this has been a step into the complete unknown, yet somewhere amongst those early mornings observing surgery in theatre, tireless afternoons conducting experiments in the laboratory or quiet nights working at our thesis, we have been inducted into the world of research.

This yearbook captures the diverse range of projects which we have been involved in, from lab-based ones to clinical trials. I hope this yearbook serves as a reminder of your dedication, resilience and hard work these past twelve months.

On behalf of the cohort, I would like to express our deep gratitude to A/Prof Megan Wallace, Brenna Dempsey, the School BMedSc(Hons.) coordinators and research staff, the Course Management Committee and all the supervisors and researchers who have assisted us in successfully navigating this year.

I have thoroughly enjoyed working with and representing you all this past year. It has been a wonderful and supportive group to be a part of, and I cannot wait to see the innovation and brilliance you will bring to your respective fields in the future!

Kind regards,

**Darren Tan
2025 BMedSc(Hons) Student Representative
Medical Research Student Society (MRSS)**

Zeineb Abbaci

Bridging Evidence and Practice in Primary Spontaneous Pneumothorax: Development of a Clinical Management Pathway and National Implementation Trial Protocol

Supervisor Names and Institute Affiliations:

Professor Diana Egerton-Warburton — Monash Health, Emergency Department

Professor Helena Teede — Monash Centre for Health Research Implementation



Hi, I'm Zee, a fourth year medical student, I started Honours thinking it would be just another research year. Spoiler: it wasn't.

My project, the first part of the national iIMPROVE PSP study, involved designing a clinical management pathway as well as a national trial protocol to bridge the gap between evidence and practice in primary spontaneous pneumothorax treatment. This journey taught me that even the best evidence doesn't mean much if it never reaches the bedside, and that's exactly where implementation science comes in.

Implementation science taught me how complex, collaborative, and persistent translating evidence into practice can be. There were challenges, long days, and countless coffee cups, but also moments of clarity and growth that made it all worth it.

This year pushed me to think differently, see the bigger picture of healthcare change, and develop skills I'm genuinely excited to carry forward.

If you're thinking about Honours, I'd say choose a project that excites and intimidates you in equal measure. The best kind of learning rarely feels just easy, and that's what makes it worth doing. I am more than glad for this honours journey!

Feel free to reach out on zeestorage8@gmail.com or zabb0004@student.monash.edu for any questions regarding the BMedSc(Hons) year or the best coffee places around Clayton!

ABSTRACT

Background

Primary spontaneous pneumothorax (PSP) is a common pleural condition that affects young, otherwise healthy individuals. Despite strong evidence supporting conservative (non-interventional) management, most patients in Australia continue to receive invasive procedures such as chest tube insertion. This reflects a persistent evidence–practice gap, driven by clinician uncertainty, institutional variation, and the absence of clear implementation pathways.

Method

This project developed two complementary research protocols to support national implementation of evidence-based PSP care. The first used a modified Delphi process to achieve multidisciplinary consensus on best-practice PSP management, involving emergency physicians, respiratory specialists, surgeons, nurses, and consumers. The second designed a stepped-wedge cluster randomised trial (SW-CRT) protocol to evaluate the implementation of the co-designed pathway across Australian hospitals.

Results

The Modified Delphi process identified key clinical and operational priorities for PSP management, including patient selection criteria, follow-up models, and safety-netting procedures. The resulting iIMPROVE PSP Pathway integrates evidence-based care recommendations with practical, context-specific implementation strategies. The SW-CRT protocol establishes a framework for assessing adoption, fidelity, and clinical outcomes while allowing gradual, equitable rollout across participating sites.

Conclusion

This project bridges the gap between evidence and practice for PSP care nationally. By combining consensus-based pathway development with a pragmatic implementation trial design, it provides a scalable model for translating research evidence into routine clinical practice, ultimately improving outcomes for primary spontaneous pneumothorax patients and enhancing health system efficiency.

Cestarangga Adikerta

Assessing cellular senescence in in vitro and in vivo models of kidney fibrosis

Supervisor Names and Institute Affiliations:

Dr Iman Azimi, Prof Sharon Ricardo, Biomedicine Discovery Institute, Department of Pharmacology



Life is a mystery, don't you think so? My name is Cesta, and finding the answer to that mystery is the meaning behind this project. Aging and senescence have always been such fascinating aspects of life. It feels as if we all have an expiration date in this existence. I want to find that answer: is there a way for us to age gracefully, without the pain and suffering that come with it? I believe life should be felt with joy, and that joy can only be pursued through health. There is already so much pain in this world. If I can ease it even a little, then my effort and my life have been worth it. To all future students, go find that "meaning" in the research you choose. I bid you good luck.

ABSTRACT

Background

Senescence is a fundamental aspect of life, an inherent imperfection that leads to the gradual decline of cellular function. Its relevance has been increasingly recognized in chronic kidney disease (CKD), a condition that imposes a significant burden on patients worldwide. One of the hallmarks of CKD is fibrosis, yet therapeutic approaches remain limited and poorly defined. This study investigates the potential role of cellular senescence in kidney fibrosis, aiming to uncover new perspectives that could inform future treatments.

Method

Three key objectives were explored: the development of a TGF- β_1 -induced renal proximal tubular epithelial cell (RPTEC) fibrosis model in vitro, the assessment of senescence within that model, and the evaluation of senescence in an in vivo ischemia-reperfusion injury (IRI) mouse model of kidney fibrosis. The in vitro study exposed RPTECs to TGF- β_1 at 1, 5, and 10 ng/mL over 7 days, assessing fibrotic (fibronectin, collagen I/III) and senescence markers (p16, p21, cell size, nucleus size) via immunocytochemistry and high-content imaging (PerkinElmer Opera Phenix). The in vivo component used frozen kidney tissue from IRI mice harvested at 14 and 70 days post-surgery, analyzed via immunofluorescence microscopy (Leica DMI8) for the senescence marker lamin B1

Results

Significant findings were limited, with the most notable result being a marked decrease in lamin B1 expression in the kidneys of mice with IRI at 14-days (18.72 ± 3.518 to 5.80 ± 2.525 pixel values, $p < 0.01$), suggesting senescence induction. At 70 days, lamin B1 levels were further reduced (0.73-fold retention in cortex; 0.52 in medulla) in IRI mouse kidneys, though without statistical significance. In vitro, increased p16 alongside decreased p21 suggested a transition to a later phase of senescence. Fibronectin levels rose while collagen I/III declined, indicating fibronectin's predominance in this model. Additionally, enlarged cell and nucleus size supported morphological features of senescence.

Conclusions

While most results did not reach statistical significance, the consistent biological trends, particularly in a novel in vitro model and the first quantitative assessment of lamin B1 in an IRI mouse model, offer compelling preliminary evidence of senescence activity in fibrotic kidneys. These findings lay critical groundwork for future studies and suggest that targeting senescence could represent a new therapeutic avenue in kidney fibrosis.

Arabella Allen

Mapping the Expanse: What Is Ethically Justified to Screen in Expanded Reproductive Carrier Screening?

Supervisor Names and Institute Affiliations:

Professor Dominic Wilkinson (University of Oxford)

Dr Giuliana Fuscaldo (Monash University)



I undertook my BMedSc(Hons) at the University of Oxford, after 4th year medicine. I've always been interested in pursuing research and really enjoyed uncovering the ethical underpinnings of medicine throughout my studies, so the Oxford-Monash Bioethics Program gave the perfect opportunity to delve into both. I chose my topic because, as an aspiring paediatrician, I wanted to explore emergent ethical challenges in paediatric and reproductive medicine and population health.

I am beyond grateful for the opportunities I have had at Oxford this year. The supervisors and academic environment provided me incredible support to develop my research and academic writing skills. Beyond the thesis, college rowing, Oxford balls, and stimulating discussions with new friends filled my year.

I would wholeheartedly recommend this program to anyone interested! Feel free to contact me for a chat:
arabella.allen32@gmail.com

ABSTRACT

Background

Expanded reproductive carrier screening (ERCS) tests prospective parents to see if they have an increased chance of passing on a genetic condition to their future child(ren). Numerous countries are looking to implement universal, publicly funded ERCS, to offer all couples who are planning pregnancy information to support their reproductive decision-making.

But deciding which conditions to screen remains ethically fraught. Some international professional guidelines suggest criteria for gene panel selection. However, these are inconsistent, incoherent and poorly connected to the overarching ethical aims of ERCS.

Body

In this thesis, I address the central research question: What ethical criteria should be used to determine the genetic conditions to include in a largescale, publicly funded Expanded Reproductive Carrier Screening program?

First, I evaluate the ethical basis for the existing guidelines for gene panel selection criteria.

I critically review and interpret the criteria currently recommended by international professional guidelines. There are four substantive characteristics which the guidelines use as sub-criteria to limit the scope of expanded panels: age of onset, carrier frequency, genotype-phenotype link and severity. The guidelines mostly recommend ERCS should screen only for severe, childhood-onset, predictable genes (and some recommend carrier frequency thresholds).

I then evaluate the ethical justifications for each sub-criterion. Drawing from the guidelines and broader ethical and empirical literature, I evaluate and weigh up the ethical claims in favour of and

counterclaims against each sub-criterion. Throughout, I apply example genetic conditions and connect my discussion to the overarching ethical aims of screening based on a public health pluralism framework. Amongst other claims, there is recurring concern that screening beyond the recommendations would offer minimal benefit (e.g. low reproductive utility) and pose risk of harm (e.g. psychological harm, resource demand). I argue that many of these claims do not apply to ERCS or provide weak ethical justification for limiting panels. I conclude that age of onset, genotype-phenotype link and severity may be appropriate sub-criteria where they are relevant for reproductive decision-making. But the extent to which they should limit expanded panels will depend on the healthcare system. Ultimately, I argue that the current guidelines are unnecessarily restrictive.

Second, I propose an ethical model of gene panel selection criteria to be applied for a universal, publicly funded ERCS program. This proposed model involves 1) an expanded offer, which screens for a broader scope of conditions than current criteria (but is limited by important contextual factors), and 2) opt-in sub-categories, so couples can choose to what extent they wish to be screened for each sub-criterion. I outline and explore various defences of and possible objections to this model. I argue that this model better supports the ethical aims of ERCS than existing models.

Conclusions

ERCS implementation requires a robust ethical basis for gene panel design. There is a call for more ethically justifiable criteria. My analysis and proposed model offer an ethical framework to interpret and apply criteria, to support programs to have panels which are transparent, ethically justified and aligned with the ethical aims of screening.

Anoushka Baruah

Primary Aldosteronism and Pregnancy: Are There Clues for Delivering a Timely Diagnosis?

Supervisor Names and Institute Affiliations:

A/Prof Jun Yang, Dr. Elisabeth Ng, A/Prof Kirsten Palmer, A/Prof Miranda Davies-Tuck, Dr. Sarah Lockie, Dr. Esther Davis.

Centre for Endocrinology and Reproductive Health, Hudson Institute of Medical Research



Hi, my name's Anoushka, and I completed my BMedSc(Hons) between my 4th and 5th years of medicine. Research always had a mysterious air about it, and whilst we have a bit of exposure throughout the course, I thought it best to dive headfirst into an honours year to truly understand what it's all about. From learning how to read the literature, write a protocol, submit ethics (and revisions), interact with consumer advocates, create a survey on Qualtrics, trawl through electronic medical records, code using R to perform all my own statistics, present my findings, and write a thesis, I have learned so many invaluable skills this year that have strengthened my understanding of how to conduct research. It is a steep learning curve, but a rewarding one.

Not to mention, honours was a welcome break from clinical placement. From that aspect, I feel refreshed and ready to jump into 5th year, and certainly well equipped for the SIP rotation. If you find the right supervisor, who has capacity to provide the support and guidance for you to excel, it can be a fantastic year. I am most happy to answer any questions regarding BMedSc(Hons) and beyond at abar0066@student.monash.edu

ABSTRACT

Background

Primary aldosteronism (PA) accounts for 10% of hypertension cases, yet it remains under-diagnosed in clinical practice, and women disproportionately experience diagnostic delays. Pregnancy, as a physiological stress test and a time when blood pressure is regularly monitored, could be a unique opportunity for identifying women with PA. Only 120 cases of PA in pregnancy have been identified in the literature, despite hypertensive disorders complicating 5-10% of all pregnancies. Of the cases reported, there are high rates of obstetric complications and distinct blood pressure patterns which may serve as clues to underlying PA.

Aims

We aimed to systematically evaluate the blood pressure trajectories and obstetric complications of women with PA in their previous pregnancies.

Method

We conducted two studies. A cross-sectional survey study (live from May – July 2025) assessed the obstetric histories of women with a self-reported diagnosis of PA, who have carried a previous pregnancy. A retrospective case-control study compared the obstetric histories of women with PA to those with other hypertension diagnoses (non-PA) seen at the Endocrine Hypertension Clinic, Monash Health (June 2016 – February 2025) who delivered at least one pregnancy at Monash Women's.

Results

The survey included 110 participants with 236 pregnancies. In at least one pregnancy, 56% of women reported experiencing hypertensive disorders of pregnancy ($n = 62$), 38% preeclampsia ($n = 42$), 28% preterm birth <37 weeks' ($n = 31$), 16% low birth weight <2500g ($n = 18$) and 15% gestational diabetes ($n = 17$).

Fifty-two women (47%) reported postpartum hypertension following any pregnancy, which was new onset for 12 (11%). Women with PA who had hypertension in pregnancy, compared to those who never did, had similar rates of other obstetric complications, and were diagnosed with PA at a significantly younger age (44.0 vs. 48.9 years respectively, $p = 0.025$).

The case-control study included 96 patients with 181 pregnancies (50 PA and 46 non-PA). Women with PA, compared to those without PA, had significantly lower rates of hypertension in pregnancy (36% vs. 63%, $p = 0.008$) and preeclampsia (18% vs. 41%, $p = 0.012$). Despite this, PA and non-PA groups had comparable rates of other complications including preterm birth <37 weeks' ($p = 0.8$), low birth weight <2500g ($p > 0.9$), gestational diabetes ($p = 0.2$), suspected intrauterine growth restriction ($p = 0.2$), stillbirth or neonatal death ($p = 0.5$) and NICU admission ($p = 0.3$). Postpartum hypertension was less frequent in the PA group compared to the non-PA group (34% vs. 59%, $p = 0.015$), however this was new onset for five women with PA and four women without PA.

Conclusions

Our research demonstrated that women with PA have much higher rates of obstetric complications than the general population, although these rates are not as high the previous case reports suggested. Despite having lower rates of hypertension in pregnancy and preeclampsia, women with PA had comparable rates of other obstetric complications as women with other hypertension diagnoses. Considerable rates of postpartum hypertension were demonstrated for women with PA, this being de novo hypertension for some. However missing postpartum data poses an important limitation to this conclusion. Further studies are warranted to prospectively examine the natural history and prevalence of PA in pregnancy.

Liam Biding

Clinical risks associated with the use of immunosuppression in cancer immunotherapy patients.

Supervisor Names and Institute Affiliations:

Dr Miles Andrews and School of Translation Medicine



Hi, I'm Liam. I undertook my Honours year after completing fourth year, driven by a strong interest in oncology, particularly the exciting advances in cancer immunotherapy. My project allowed me to explore this evolving field in depth while developing a wide range of valuable skills. Throughout the year, I've learned how to critically analyse complex datasets, write scientific papers, and code effectively for data analysis. These skills have not only strengthened my research abilities but will also be invaluable in my future career as a clinician.

While Honours can be challenging at times, especially during thesis writing, it's an incredibly rewarding experience. You're surrounded by supervisors, peers, and mentors who genuinely want to see you succeed. My advice to future students is to embrace the process, stay curious, and make the most of every opportunity to learn. You'll finish the year with far more confidence, knowledge, and skills than you could ever anticipate.

ABSTRACT

Background

Immune checkpoint inhibitors (ICIs) have transformed the treatment of multiple cancers but are limited by immune-related adverse events (irAEs), arising from off-target immune activation. While irAEs are well documented in clinical trials, real-world data on their incidence, severity, and management in tertiary centres are limited. Furthermore, although management guidelines exist, little is known about adherence to them, or whether the use of immunosuppressive agents to treat irAEs increases infection risk. This thesis therefore aimed to quantify the rates, types, and severities of irAEs in a mixed cancer population at a tertiary centre; describe the use of immunosuppressants in irAE management and compare practice with guideline recommendations; and assess whether immunosuppressive therapy for irAEs was associated with an increased risk of infection.

Method

This retrospective cohort study included 321 medical oncology patients who received ICIs at The Alfred Hospital between June 2020 and March 2023. Data were extracted from electronic medical records and analysed using the R statistical software environment.

Results

The incidence and spectrum of irAEs in this cohort mirrored findings from major clinical trials. The most frequent irAEs were skin toxicities (36.4%), colitis (26.2%), and hepatitis (22.7%), with the majority being grade 2 or lower (79.5%). Combination therapy with anti-CTLA-4 and anti-PD-(L)1 was associated with

higher overall irAE rates (83.6%) and the largest proportion of grade ≥ 3 events (49.1%). Management was broadly guideline-concordant: oral prednisolone was the most used agent (32.6%), and only 23.1% of patients required second-line therapies. Immunosuppression was associated with a higher number of infections (median 1 vs. 0), but not with invasive infections. Within-patient analyses showed no increase in infection rates before versus after immunosuppression (IRR 0.89, 95% CI 0.57–1.41, $p = 0.62$).

irAEs were also associated with improved survival: median OS was 6.8 months (95% CI 4.6–10.4) in patients without irAEs, compared with 42.3 months (95% CI 31.4–NE) in those with grade 1–2 irAEs and 44.9 months (95% CI 33.8–NE) in those with grade 3–4 irAEs. Immunosuppression for irAE management was also associated with longer survival; however, this is likely explained by confounding, as patients requiring immunosuppression are those who develop irAEs, which themselves are generally considered a surrogate of immune activation and favourable tumour response.

Conclusions

In conclusion, real-world irAE incidence, severity, and management in this cohort closely aligned with clinical trial data and guideline recommendations. Although immunosuppression was associated with a greater number of infections, these were not clinically significant and there was no evidence of increased invasive events. The observed survival benefit was likely attributable to the occurrence of irAEs, reflecting immune activation, rather than to the use of immunosuppressive therapy.

William Browning

Responsibility Attribution for AI-Powered Robotic Surgical Harms

Supervisor Names and Institute Affiliations:

Dr Rebecca Brown, Oxford Uehiro Centre

Professor Adrian Carter, Monash Bioethics Centre



I've been very fortunate to enjoy a year on exchange completing my BMedSc(Hons) project at the Oxford Uehiro Centre for practical bioethics. My project, examining how moral responsibility should be attributed for surgical harms caused by AI, lies at the intersection of my interests in medical ethics, surgery, AI, and robotics/tech.

It's been a challenging and rewarding year, as well as a thoroughly enjoyable one getting to involve myself in all aspects of Oxford college life. The opportunity to undertake a wholly philosophical and conceptual research project has been deeply stimulating. I can't recommend highly enough this program and am extremely happy to be contacted to discuss it, or any other aspects of the Honours program more broadly. Thanks go to my supervisors, Becky Brown and Adrian Carter, for their extremely attentive and insightful guidance, as well as the Monash and Oxford administrative teams who helped make it possible

ABSTRACT

Background

AI-powered robotic surgical platforms are advancing at astonishing pace and are transitioning from proof-of-concept trials to a level of refinement which is close to clinical reality. This technological development presents pressing challenges regarding the attribution of moral responsibility for AI-powered harms; when a machine hurts a patient, who is held responsible? Traditionally, the chain of causation between the surgeon's actions to patient outcomes was clear; however, the introduction of machine autonomy now complicates this understanding. A key concern is the 'responsibility gap' when a harm has occurred which is not directly attributable to a human agent. Significant research and discourse surrounds comparable autonomous technologies, such as autonomous vehicles and weapons, however procedural surgical AI is, ethically speaking, dramatically underexplored.

Methods

This project answers the question of how moral responsibility should be attributed for AI-powered robotic surgical harms. It develops an ethical framework that both proactively narrows responsibility gaps, and guides the attribution of moral responsibility for harms caused by AI-powered procedural surgical platforms. This research utilises a comparative philosophical analysis approach to examine the pertinent discourse surrounding relevant similar autonomous systems and distils lessons which can be applied to procedural surgical AI. This methodology suits the fundamentally normative nature of the research question and provides proactive ethical guidance as the technology is clinically implemented.

Results

This project proposes 3 novel conceptual contributions to the philosophical discourse. Firstly, it proposes a risk tolerance threshold for new technologies to be considered under human control. Secondly, it proposes the 'Micro/Macro Decision Distinction' which delineates machine reasoning to resolve the problem of human supervision of epistemically advantaged machines. Finally, it suggests a shift towards a prospective view of role-obligations along the pipeline of AI development and implementation. Furthermore, the culminative output of this research is the construction of the Framework. It takes the form of an interlinked set of role obligations for all those along the AI pipeline. By clearly defining stakeholder responsibilities, it increases human control of autonomous surgical AI (and therefore narrows responsibility gaps) and provides a retrospective blame attribution tool when harms do occur.

Conclusion

This project sits right at the neglected juncture of Ethics, AI, Surgery and Robotics, and addresses a significant literature gap. It not only proposes novel ideas and a novel framework, but will prompt discussion within the philosophical community in this area, leading to further developments in the field. It lays the foundation for further empirical validation studies and collaboration with legal experts to examine how the philosophical discourse can be translated into actionable policy

Audrey Chong

Changes in Perfusion Imaging- Arterial Spin Labelling Study

Supervisor Names and Institute Affiliations:

Professor Thanh G Phan and Dr Jason Vuong

Stroke and Ageing Research Group, School of Clinical Sciences, Monash University

Department of Neurology, Monash Medical Centre, Monash health



Hi! My name is Audrey and I completed my BMedSc(Hons) with the stroke and ageing research group at the Hudson Institute. I have always been interested in doing research during medical school, however had previously found it challenging to balance full time studies, research and other commitments. Therefore, I saw an honours year as the perfect opportunity to be fully engaged and immersed in the research side of medicine.

I chose my project because imaging has always been an interest of mine, particularly neuroimaging. My project involved comparing brain scans of stroke patients and determining whether a new modality (called ASL) could one day be implemented in stroke protocols. The learning curve for this was steep and involved learning how to use over 5 different neuroimaging tools, many of which required coding skills. However, I have been fortunate to have great supervisors who have offered support and guidance whenever I needed it.

Overall, I found my honours year challenging but also refreshing. Outside of working on my project I was able to focus on, and even pick up, some new hobbies. My advice for future students is to set clear goals and expectations with your supervisors from the beginning, and always allow extra time to complete assessments, as the year goes by much faster than you think! Please feel free to reach out if you have any further questions.

ABSTRACT

Background

Acute Ischaemic Stroke (AIS) is a medical emergency occurring due to occlusion of an artery supplying brain tissue, leading to ischaemia and eventual tissue death. Imaging is important in AIS as it helps identify areas of irreversibly damaged tissue (ischaemic core) as well as salvageable regions (penumbra). Currently, computed tomography perfusion (CTP) and magnetic resonance perfusion (MRP) can be used in the assessment of AIS. However, both require the administration of contrast which is contraindicated in patients with renal impairment or allergies.

A new type of imaging modality known as arterial spin labelling (ASL) offers an attractive alternative as it is completely non-invasive, using the patient's own labelled blood as an endogenous tracer in place of contrast. As an emerging technique, there is limited evidence available regarding the use of ASL in AIS.

Aims

The aim of this study is to determine whether there are any differences between ASL and CTP in detecting ischaemic stroke lesions, and subsequently identify an appropriate ASL threshold for ischaemic core.

Method

We designed a retrospective pilot analysis of data collected from the I-ACT trial, comparing ASL and CTP scans of patients on day 0. All images underwent a number of processing steps to produce maps of mean cerebral blood flow (CBF). A standardised threshold of 30% relative CBF (rCBF) was applied to the CTP images to isolate ischaemic core. Various thresholds ranging from 10-40% rCBF were applied to the ASL images at 5% increments. All images were

then manually inspected to ensure proper lesion detection and localisation. Next, we calculated volume of each lesion to determine the most appropriate ASL threshold- this was the threshold that yielded a lesion volume closest to the CTP scan. Finally, we also looked at the overlapping regions between ASL and CTP lesions, calculating volume of overlap and dice similarity coefficients (DSC).

Results

A total of 5 patients were included in the study. The cohort was 100% male with mean age 65 years. All 5 patients had occlusions of the middle cerebral artery (MCA), 3 were left-sided and 2 were right-sided occlusions. Every processed ASL and CTP scan was able to both detect and localise the lesion. In comparing volumes, the optimal ASL threshold varied across our cohort from 20-40%; the absolute volume difference was <1mL for all patients. However, at these optimal thresholds, a mean DSC of 0.51 ± 0.21 indicated only moderate overlap. This finding highlights a fundamental principle in neuroimaging analysis: volume does not equal location. From a voxel-based perspective, we found that the 8 threshold with the highest overlap was 40% across all patients, although mean DSC remained moderate at 0.55 ± 0.21 . Given the limited sample size, we have not been able to determine a suitable ASL threshold within this study.

Conclusions

ASL can be used to detect regions of AIS, however an appropriate threshold to delineate ischaemic core is still yet to be determined. This study is the first in a line of future research to help validate ASL in acute stroke imaging.

Sienna Destradi

Evaluation of Telehealth Services: Thematic Analysis of Patient and Clinician Perspectives

Supervisor Names and Institute Affiliations:

Professor Ram Nataraja, Associate Professor Kiarash Taghavi

Department of Paediatrics, Monash University and Monash Health



I chose to complete a BMedSc(Hons) due to its unique opportunity for a dedicated research year before graduating, to gain valuable skills and experience. I decided to undertake a qualitative research project with the Monash Children's Simulation Centre. I enjoyed the year and feel that it has provided me with a good foundation for future research. I'm happy to be contacted by any students considering doing an honours year, and would overall highly recommend undertaking a BMedSc(Hons), especially with the Monash Simulation/paediatric surgery team at Monash Health.

ABSTRACT

Background

Telehealth usage has increased in Australia, especially over the course of the COVID-19 pandemic. Across Monash Health, pre-existing telehealth services were already present, with quality assurance research for evaluation and improvement embedded within these services. During the COVID-19 pandemic, there was an increased reliance on these telehealth services to support healthcare delivery during this time. In the post-COVID period, telehealth is now a common component of healthcare provision within this health service.

Method

The aims of this research were to explore patient perspectives on telehealth services, and clinician perspectives on features for successful telehealth utilisation. Participants were patients and clinicians who took part in a telehealth consultation between 2018 and 2024. Data from the open-ended components of a opt-in voluntary survey following these consultations were analysed using Braun and Clarke's six phases of reflexive thematic analysis. Two thematic analyses were conducted, focusing separately on patient and clinician groups.

Results

The patient thematic analysis resulted in the conceptualisation of seven overarching themes reflecting patient perspectives: minimisation of impact, accessibility of healthcare services, avoidance of perceived or actual risk, technology affecting accessibility of healthcare, impacts to patient agency, operational factors impact access to telehealth and comparisons to expectations of a traditional clinical encounter. The clinician thematic analysis generated three overarching themes, reflecting their views on important factors for telehealth delivery: technological factors for effective healthcare provision, operational factors for an effective telehealth service and optimising telehealth consultations to meet traditional clinical expectations.

Conclusion

Findings from this research can be used to guide specific improvements within Monash Health service and provide general areas of consideration and focus when developing telehealth services in other healthcare institutions.

Asha Doolabh

An open-label extension trial of dual topical and oral antibiotics as concurrent male partner treatment for bacterial vaginosis

Supervisor Names and Institute Affiliations:

Professor Catriona Bradshaw

Melbourne Sexual Health Centre, Alfred Health
School of Translational Medicine, Monash University
Melbourne School of Population and Global Health,
University of Melbourne

Lenka Vodstrcil (she/her)

Senior Research Fellow
Deputy Head, Genital Microbiota and
Mycoplasma Group
President, Sexual Health Society of Victoria
Associate Editor, Sexually Transmitted Infections

School of Translational Medicine, FMNHS, Monash
University
Melbourne Sexual Health Centre, The Alfred Hospital
Melbourne School of Population & Global Health,
University of Melbourne



My name is Asha (she/her). I am going into my final year now, after completing my BMedSc(Hons) Honours year. My project was in sexual health, as I am really interested in women's health and public health. I chose this project because I felt that sexual health seemed under researched and we received limited education on it in medical school.

My supervisors were not only incredibly knowledgeable, but I had heard beforehand, how willing they were to teach, and this held true in their generosity throughout. I chose this particular topic as I felt very inspired by the work of the team, especially as they are all successful women, and I wanted to surround myself by that atmosphere. Absolutely happy for future students to contact me.

ABSTRACT

Background

Bacterial Vaginosis (BV) is a vaginal condition affecting 30% of women in the reproductive age group. It can cause a malodorous discharge, and can lead to several reproductive and obstetric complications. Standard female only treatment results in unacceptably high recurrence. With growing evidence for the sexual transmission of BV, concurrent male partner treatment (MPT) with dual oral and topical antibiotics, targeting the penile cutaneous and urethral carriage of BV-associated-bacteria (BVAB), has been investigated in a recent randomised control trial (RCT).

This dual treatment was highly effective at reducing reinfection in the female, halving BV recurrence at twelve weeks from 46 to 17%. This led to an open-label extension study, which aimed to determine the efficacy of treatment outside of the RCT setting and to explore the factors associated with recurrence in this population. We also aimed to assess the acceptability of MPT among male participants.

Methods

In this open-label extension study, women with BV who had a male regular sexual partner (RSP) were recruited from Melbourne Sexual Health Centre between December 2023 and April 2025. BV was defined as 3-4 Amsel criteria (requiring clinical assessment and findings on microscopy) and a Nugent score of 4-10 (which assesses bacterial morphotypes on microscopy). All women were provided standard treatment, and their RSP was given a seven-day course of oral metronidazole and topical clindamycin. Before treatment (day 0), the day after treatment (day 8) and at four weeks, couples completed a questionnaire and provided samples including a vaginal smear for microscopy. Couples were eligible for the primary efficacy analysis if the female partner had BV assessed at week 4 (as for enrolment). Additionally, day 8 smears were assessed using Nugent score. Questionnaires collected demographic, behavioural and adherence data, and male participants answered additional questions on the acceptability of MPT. Data analyses including descriptive statistics, proportions,

and univariate and multivariate logistic regression were conducted using STATA.

Results

In this study, 102 women were approached, 88 couples were eligible and enrolled and 70 couples remained in the study until week 4 and were included in analyses. By week four, 20 (29%) women had experienced BV recurrence (95% confidence interval (CI) 18.40-40.62). Having a NS of 4 to 10 immediately after treatment, was associated with a significant increased odds of recurrence by four weeks (odds ratio (OR) 9.92, 95%CI 2.73-36.08, p value <0.001). Adherence to treatment in women was high, with over 92% taking all their medication. Adherence to treatment in men was lower, with 66% of men taking all their medications, despite a lower proportion of males reporting adverse effects to the medications than the females. Overall men reported higher adherence to oral tablets compared to the topical antibiotic cream, and in the surveys reported a preference towards the oral tablets over cream and found them easier to use. However, when asked about acceptability, over 80% of men reported that the topical and oral antibiotics, easy to use and most men would take them again, if needed.

Conclusions

In conclusion, although MPT has been shown to reduce BV recurrence, 29% of women in this open-label extension experienced treatment failure. This study found that an elevated NS (i.e., was 4-10) on the day after treatment (day 8) was associated with treatment failure at week four. The majority of women had not resumed sex at day 8, suggesting that some women experienced BV persistence and treatment failure. Our study suggests that assessing a woman's microbiota immediately after treatment may be a useful tool in predicting treatment failure and can enable more intensive treatment strategies to be promptly initiated. This open-label extension study shows that while MPT is acceptable and tolerable to men, they are less adherent to the cream than to oral therapy and indicates a need for efforts to be directed at improving adherence to topical therapy.

Sarah Harrington

Brain Fog, Fatigue and Psychological Distress in Inflammatory Bowel Disease

Supervisor Names and Institute Affiliations:

- A/Prof Rimma Goldberg – School of Clinical Sciences Monash University, Monash Health
- A/Prof Simon Knowles – Swinburne University of Technology
- A/Prof Gregory Moore – Monash University



I chose to pursue the BMedSc(Hons) after fourth year as an opportunity to step back from clinical medicine and immerse myself in research, something I hadn't previously experienced. With a longstanding interest in gastroenterology, particularly autoimmune conditions and the gut-brain axis, I undertook a project in this area, which further reinforced my passion for the field.

Throughout the Honours year, I developed a wide range of skills including navigating the ethics process, managing data, applying statistical analysis tools, and refining my critical thinking. While there were challenges along the way, having a full year dedicated to research allowed me to build strong foundations and grow in confidence for future research endeavours.

Reflecting on the experience, I have no regrets. It was a valuable and rewarding year, and I would highly recommend Honours to anyone looking to take a meaningful break from clinical placement while staying engaged with medicine. I'm happy to be contacted via email if you have any questions shar0091@student.monash.edu

ABSTRACT

Background

Fatigue and psychological distress are common in individuals living with Inflammatory Bowel Disease (IBD) and have been linked to active disease and a reduced quality of life (QoL). Emerging evidence suggests brain fog is also common, yet its mechanisms remain poorly understood and researched. Existing studies examining the relationship between IBD activity and psychological symptoms have predominately relied on patient-reported symptoms, with minimal exploration of objective inflammatory markers. No studies have explored the association between brain fog and objective inflammation in IBD. This highlights an important gap in understanding how IBD activity, particularly objective inflammation, relates to psychological symptoms and impacts QoL.

Aims

1. Explore the relationship between IBD activity, as indicated by both objective markers and patient-reported symptoms, and brain fog, fatigue, psychological distress and quality of life.
2. Explore the role of brain fog and fatigue in mediating the relationship between IBD activity and QoL, after controlling for psychological distress.

Method

This cross-sectional study recruited participants from the Monash Health IBD clinic who completed a validated online questionnaire assessing sociodemographic and IBD characteristics, IBD symptoms, brain fog, fatigue, psychological distress and QoL. Objective markers of disease activity (CRP, faecal calprotectin, endoscopy, imaging) were extracted from medical records. Spearman's rank assessed for correlation, and a validated

mediation model explored the mediating effects of brain fog and fatigue on the relation between IBD activity and QoL.

Results

Of the 209 participants (Crohn's Disease (CD) =110, Ulcerative Colitis (UC)=99), 60.3% reported brain fog. Fatigue was common amongst those who reported brain fog (67.5%) however 43.7% experienced brain fog when not fatigued. Brain fog was significantly more common in participants with active IBD symptoms, yet 53.2% reported it does not improve alongside symptoms. IBD symptom activity was significantly correlated with brain fog, fatigue and psychological distress in CD, but only psychological distress in UC.

There was no significant correlation between objective markers of IBD activity and brain fog, fatigue or psychological distress. However, QoL was negatively correlated with both IBD symptoms and objective markers. Multiple factors predicted brain fog on univariate analysis, however only fatigue and psychological distress remained significant on multivariate analysis. Brain fog and fatigue did not mediate the relationship between IBD symptoms and QoL, after controlling for psychological distress. Instead, fatigue and psychological distress mediated the relationship between IBD symptoms and brain fog.

Conclusions

This is the first study to explore the association between brain fog and objective inflammation in IBD. Findings suggest IBD symptoms, more than objective markers, are linked to brain fog, fatigue and psychological distress, particularly in CD. It proposes a complex relationship between brain fog and IBD activity that is mediated by fatigue and psychological distress.

Sharni Howlett

Using Human Amnion Epithelial Cells in Long-Term Ventilator-Induced Lung Injury in Preterm Sheep

Supervisor Names and Institute Affiliations:

Professor Graeme Polglase (The Ritchie Centre, Hudson Institute of Medical Research) (Department of Paediatrics, Monash University)

Doctor Paris Papagianis (Department of Pharmacology, Biomedicine Discovery Institute, Monash University)



After finishing 4th year, I decided to undertake BMedSc(Hons) to allow myself the opportunity to learn new skills and get a taste for what research was all about. I chose my project because of my interest in paediatrics and interest in gaining lab-based experience. Whilst completing honours has been a steep learning curve, it has allowed me to further develop my critical thinking and communication skills that I know will be transferable into my future career. I would like to thank my supervisors and everyone in my lab group for making this an amazing year!

ABSTRACT

Background

Preterm birth occurs before lung development is complete, requiring respiratory support. Respiratory support can lead to ventilation-induced lung injury (VILI), creating inflammation and structural damage and increasing risk of the incurable bronchopulmonary dysplasia (BPD). Recent efforts explore human amnion epithelial cells (hAECs) to mitigate VILI. HAECs are derived from the placental amniotic membrane and have both multipotent and pluripotent properties, are anti-inflammatory and immunomodulatory through secretion of soluble factors. HAECs in short-term ventilation studies reduce VILI, however their efficacy in long-term ventilation studies is unknown.

Aims

To assess the efficacy of immediate or delayed hAEC administration to reduce lung inflammation and injury in preterm lambs on respiratory support.

Method

Preterm lambs were delivered via caesarean section at 124 days of gestation and randomly assigned to groups; unventilated control (killed immediately; n=7), ventilation + saline (n=7), ventilation + early hAECs (3,000,000 hAECs/kg/day intravenous (IV) on days 1, 2 and 3; n=10) and ventilation + late hAECs (3,000,000 hAECs/kg/day IV on days 4, 5 and 6; n=7). Arterial blood gases informed respiratory support requirements throughout the experiment. At day 7 lambs were killed, the left lung was fixed for histology and the upper right lobe snap frozen for molecular analysis. Immunohistochemistry for CD45 leukocytes, CD163 macrophages, Hart's resorcin-fuchsin elastin stain and picrosirius red collagen stains were performed. Fluidigm® Taqman® RT-PCR was used to assess gene expression. Statistical analysis was conducted using GraphPad Prism.

Result

All animals weighed the same at 7 days and did not have different respiratory requirements despite hAEC administration. Early and late hAECs caused elevation in the percentage of leukocytes and macrophages compared to the saline group ($p < 0.0001$), with late cells having higher percentage of macrophages compared to early hAEC group ($p < 0.0001$). There was a positive correlation ($r = 0.4256$) between time spent on mechanical ventilation and leukocytes across all groups. Transforming growth factor beta-1 mRNA was highest in the late hAECs group compared to all other groups ($p < 0.01$).

Expression of surfactant protein A1 was increased in all ventilated groups compared to unventilated controls ($p < 0.05$) but no other differences were noted in surfactant proteins. The amount of lung tissue was reduced after late hAECs compared to all other groups. All ventilated lambs had increased elastin in the lungs compared to unventilated controls ($p < 0.001$) but only the early hAECs group saw increased collagen deposition ($p < 0.05$). Gene expression of vascular markers, vascular endothelial growth factor receptor 1 and angiopoietin-2, was reduced in the early hAECs group ($p < 0.05$), while angiogenin-1 was reduced in all ventilated groups compared to the unventilated controls ($p < 0.05$).

Conclusions

Our study demonstrates hAECs did not reduce respiratory requirements or lung inflammation in preterm lambs at 7 days of life. This study recapitulates the complex heterogenous nature of a NICU and demonstrates hAECs may not be efficacious in ventilated newborns.

Elizabeth Hoyer

Acute peripartum twin-to-twin transfusion syndrome; is it controlled by blood pressure differences between twins?

Supervisor Names and Institute Affiliations:

Dr Indya Davies, Prof Stuart Hooper and Dr Kelly Crossley.

The Ritchie Centre, Hudson Institute of Medical Research



I chose to do my BMedSc(Hons) at the Ritchie Centre, focusing on perinatal and transition-at-birth research, because I'm interested in paediatrics and wanted to learn about pre-clinical research.

Honours has been such an exciting and rewarding experience. I'm so grateful for all the opportunities I've had this year to develop new skills and learn about research, statistics and how to critically evaluate evidence. I've developed a new appreciation of how clinical practice is shaped.

I'd highly recommend Honours to anyone interested in contributing to the field. There are so many projects and amazing supervisors out there, it's just a matter of finding the right one for you! I'm more than happy to answer any questions at ehoy0003@student.monash.edu.

ABSTRACT

Background

Most (96%) monochorionic twins have vascular connections or 'anastomoses' within their shared placenta, which interconnect their circulations and allow intertwin blood transfer. These anastomoses can occur without complications during development. However, in acute peripartum twin-to-twin transfusion syndrome (TTTS), the circulation can become unbalanced at birth, and large blood transfusions from one twin ('donor') to the other ('recipient'), causing serious complications. We developed a world-first animal model to understand the factors regulating acute peripartum TTTS. We aimed to determine the role of blood pressure in controlling blood flow through an artery-to-artery anastomosis during acute peripartum twin-to-twin transfusion in sheep.

Methods:

Twin-pregnant ewes were anaesthetised and underwent caesarean section at 132 ± 2 days of gestation ($n=7$). Both fetuses were instrumented with carotid artery catheters to measure arterial blood pressure and heart rate, then were returned to the uterus. An artificial anastomosis was created by inserting a catheter into one umbilical artery of each twin, surrounded by a flow probe to measure blood flow. A 10-minute control period with the anastomosis open allowed blood to flow between the twins and enabled identification of a 'donor' and 'recipient.' The donor was exteriorised from the uterus and mechanically ventilated for 10 minutes with an intact umbilical cord and a closed anastomosis until lung aeration was achieved. The anastomosis was then opened to observe intertwin blood transfer. The ventilated twin's umbilical cord was then clamped while the anastomosis remained open. The second twin was then exteriorised and mechanically ventilated with an intact

umbilical cord. Fetal arterial blood samples were collected at regular timepoints for blood gas analysis.

Results

The intertwin blood pressure difference determined the anastomosis flow ($p < 0.05$, R^2 values: 0.3154 - 0.9291). Intertwin blood flow through the anastomosis was recorded as a low-frequency sine wave. The difference between twins' heart rates determined the period (duration) of the sine wave ($p < 0.001$). The number of pulses (cycles) in a period indicated when the twins' heartbeats were out of synchrony (one twin in diastole and one in systole). An increased heart rate difference meant the twins' heartbeats came into and out of phase more frequently (fewer pulses). On-cord ventilation reversed intertwin blood flow in 4/7 twin pairs. Clamping the first twin's umbilical cord caused rapid blood loss from the second twin into the placenta in 4/7 twin pairs ($p < 0.0001$). There were no statistical differences in haemoglobin levels, birthweight discordance and sex differences between all twin pairs.

Conclusion

We developed a novel animal model to simulate intertwin blood flow during acute peripartum TTTS. While this model needs refinement, we showed that the intertwin blood pressure difference directly controls blood flow through an artery-to-artery anastomosis. Heart rate controls twins' heartbeat synchrony, and intertwin heart rate differences determine the anastomosis low-frequency sine wave period. Interventions promoting intertwin blood pressure balance, like on-cord ventilation, could minimise intertwin transfusion. Second-born twins are at risk of major blood loss into the placenta following umbilical cord clamping of first-born twins; cord clamping practices in acute peripartum TTTS require further review.

Ishika Ishika

Identification and Evaluation of Risk Prediction Models and Patient Reported Outcomes Measures (PROMs) in Medication's Adherence in Cardiovascular Disease Prevention

Supervisor Names and Institute Affiliations:

Supervisor: Dr Stella Talic

Co-Supervisors: Miss Caroline Trin and Dr Harvey Jia Wei Koh

School of Public Health and Preventive Medicine



For my honours year in the Bachelor of Medical Science program at Monash, I worked on a project that examined patient-reported outcome measures (PROMs) and risk prediction models for medication adherence in cardiovascular disease. Understanding why patients might not take their medications as prescribed and how tools can help identify and support those at risk are the reasons I chose this topic because I wanted to work on something that had both clinical relevance and research depth. I've improved my organizational and analytical abilities over this course and learnt how to oversee a complex systematic review with evaluating papers critically using frameworks such as PROBAST and COSMIN.

If I could advise future students on one thing, it would be to value the process more than just the outcome. Weeks will feel long, but every little step counts, and you'll be shocked at how much you've changed by the end. Everyone's project develops differently, so don't compare your progress to others, take care of yourself outside of the course, and celebrate little wins. Although the Honours year can be difficult, it's also an incredible opportunity to go deeply into a subject you're passionate about and emerge stronger, more competent, and more self-assured.

ABSTRACT

Background

Cardiovascular disease (CVD) continues to be the major cause of death worldwide. Poor long-term adherence to medication limits the practical efficacy of primary and secondary prevention. Patient-reported outcome measures (PROMs) and risk prediction models are two complementary methods used to detect and comprehend non-adherence, although they rarely get evaluated in combination.

Method

MEDLINE, Embase, Emcare, Scopus, and Web of Science were all included in a PRISMA-aligned systematic review (search date: April 13, 2025) of studies conducted on adults aged 18 and older that used either a prediction model or a validated PROM and reported quantitative adherence outcomes (ex: PDC, categorical/binary adherence). PEO framework was used for eligibility. TRIPOD was used to evaluate reporting, PROBAST (models) and COSMIN (proms) were used to evaluate quality, and screening and data extraction was also done. By consensus, disagreements were settled.

Results

A list of adherence prediction models and PROMs that are limited to the prevention of CVD was gathered. Prediction models frequently used machine-learning techniques (random forests, SVMs, neural networks, gradient boosting) or logistic/Cox regression, combining behavioural, clinical, and sociodemographic factors.

The primary PROBAST concerns were analysis-domain problems (handling missing data, overfitting, and treatment of continuous predictors). Most reported good discrimination but rarely evaluated calibration or external validity. Prior models (ex: Orensky 2005, Son 2010) had

significant weaknesses. Models by Lucas (2017), Tannous (2024), Cupido (2023), Hsu (2022), and Cao (2023) demonstrated relatively stronger approach and performance.

The most popular PROMs were MMAS-8 and MARS-5, which were followed by SPUR-27 and the Adherence Estimator. Variability was seen in the COSMIN appraisal: MARS-5 demonstrated mixed internal consistency and criterion validity, whereas MMAS-8 exhibited clearer content and structural validity, but uneven cross-cultural validity and responsiveness despite extensive use. While SPUR-27 showed promise but lacked sufficient validation, the Adherence Estimator (3 items) showed strong content and criteria validity with pragmatic limitations. In general, there was little evidence for MMAS-4, MGT-4, and older/self-developed tools.

Conclusions

Adherence across settings cannot be accurately predicted or measured by a single technique. Although modern prediction models are getting better, they still require regular calibration reporting and outside validation. MARS-5 and the Adherence Estimator seem to be the strongest PROMs while the cross-context reliability of MMAS-8 is questionable and SPUR-27 needs more research. Combining data-driven prediction models (which determine "who/when") with PROMs (which explain "why") provides a workable path to more effective CVD prevention and focused, patient-centered therapies. Transparent model reporting, standardized adherence indicators, cross-cultural PROM validation, and prospective assessments of integrated PROM-plus-model workflows should be the top priorities of future research.

Rahul Kakria

When private companies develop AI radiology screening tools, do they have an ethical obligation to share profits with patients?

Supervisor Names and Institute Affiliations:

Professor Thomas Douglas, Dr Gabriel De Marco, Dr John Gardener
Oxford Uehiro Centre, Oxford University and Monash Bioethics Centre



Rahul Kakria is a BMedSc(Hons) student interested in the implementation of Artificial Intelligence in Medicine and the ethical concerns surrounding this. Having completed his 4th year of medical school at Monash University in Melbourne, Australia, Rahul has spent the year researching AI ethics in Radiology at the University of Oxford.

He is keenly interested to pursue a medical career in either surgery or radiology, and this year has been instrumental in solidifying this interest. Outside of his studies, Rahul thoroughly enjoys his tennis and golf, as well as exploring new cafes throughout his travels! To contact Rahul for advice or any further information, please feel free to email rahulkakria16@gmail.com

ABSTRACT

Background

This thesis critically evaluates whether patients should be entitled to a share of commercially generated profits from radiological AI technologies developed using their health data. This research seeks to provide arguments which inform policymakers, and healthcare stakeholders about fairer models of profit-sharing that respect patient contributions while balancing innovation in the development of medical AI.

Methods

Normative ethical analysis is employed to examine whether patients should have a share in the profits generated by radiological AI technology developed using their health data. Opposing arguments which reject profit-sharing with patients are challenged in this research by using principles of distributive justice, particularly the contribution principle.

The method involves normative analysis, especially analogical reasoning, drawing parallels with property rights, hazardous employment, and clinical trial participation to illustrate how risk and ownership of raw data constitute meaningful forms of contribution which warrant sharing profits with patients.

Results

The analysis demonstrates that patients warrant a share of profits generated from medical AI. Two key findings emerge. First, patient risk exposure - through privacy breaches, re-identification, and stigma - constitutes a tangible contribution that merits compensation. Second, patients' ownership of raw data establishes a legitimate basis for profit-sharing. Potential objections to the stance of this thesis, such as risk of data bias, threats to altruism, and coercion, are also considered, and responded to. Collectively, these arguments and responses create a strong ethical basis for profit-sharing with patients.

Conclusion

As per principles of distributive justice, patients' contributions, through the risks they take on and their data ownership, create a strong ethical basis for profit-sharing when their health data is used in commercial medical AI development.

Ananda Nirmala Ratu Kamila

AGE OF DIAGNOSIS OF FRAGILE X SYNDROME IN CHILDREN AND ITS IMPACT ON PROGNOSTIC OUTCOMES: A SYSTEMATIC REVIEW AND META-ANALYSIS

Supervisor Names and Institute Affiliations:

1. Dr. Mohammed Alshawsh

2. Professor Katrina Williams

Monash Health (COMPLEX AUTISM AND NEURODEVELOPMENT Research Group of Paediatric Department in Monash Children Hospital)



Hi! I'm Nirmala, a third-year medical student at Universitas Indonesia who completed a BMedSc(Honours) year at Monash. I chose this project because I'm deeply interested in Paediatrics and found that the topic of Fragile X Syndrome (FXS) is still underdiscussed in my country.

I'm very grateful to have had amazing supervisors who guided me throughout this research journey. Through this experience, I've learned a great deal about conducting systematic reviews, a bit of coding for data analysis, and collaborating effectively within a team. It has also helped me develop a more critical mindset, to think like a researcher, not just a student.

My advice would be: don't throw away your shot (yes, a Hamilton reference!). Keep taking opportunities and learn as you go. But remember that your physical and mental well-being matter too; don't push yourself to the point of exhaustion. If you're interested in asking about my experience, you can contact me at ratu.kamila.an@gmail.com

ABSTRACT

Background

Fragile X Syndrome (FXS) is the most common genetic cause of autism and a hereditary form of intellectual disability (ID). FXS can be detected as early as 11 weeks of gestation, however, the current average age of diagnosis is 36 months. Delays in diagnosis may significantly influence outcomes for the child, family, and broader support systems.

This systematic review and meta-analysis aim to explore how the age of diagnosis in children with FXS affects the prognostic outcomes and to identify factors associated with delayed or early diagnosis.

Method

The protocol of this review has been registered in PROSPERO with reference number CRD42024590204. Systematic searches were conducted across MEDLINE, Embase, PsycINFO, CINAHL, Scopus, and ProQuest electronic databases. Study selection involved title and abstract screening, full-text review, and data extraction using Covidence. Meta-analyses were carried out using R software with the meta package version 8.0-2. Risk of bias was assessed by two independent reviewers using a modified Quality in Prognostic Studies (QUIPS) tool.

Results

A total of 13,985 records were identified, with 48 studies screened for eligibility, and a total of 21 studies were ultimately included. Across these, 9 prognostic outcomes and 21 influencing factors related to age of diagnosis were identified; however, only 4 outcomes had sufficient quantitative data for meta-analysis.

Delayed diagnosis was associated with a 58% increased risk (95% CI: 0.40-0.76) of having a second affected child prior to the first child's diagnosis, based on data from four studies involving 519 children. Early diagnosis was linked to an 83% higher rate (95% CI: 0.49-1.00) of pregnancy termination (two studies, 64 children).

Conclusions

This review highlights the impact that the age of diagnosis plays in determining prognostic outcomes for children and their families, especially family planning. This review may act as a direction for future well-designed studies to better understand and quantify the role of diagnostic timing in FXS.

Kavinnath Karunaratna

Supplemental Oxygen Therapy at Hospital Discharge in Very Preterm Infants with Bronchopulmonary Dysplasia

Supervisor Names and Institute Affiliations:

Kenneth Tan (Department of Paediatrics, Monash University, Australia), Kei Lui (School of Women's and Children's Health, University of New South Wales, Australia)



I chose to undertake my honours project in the field of paediatrics, specifically neonatology, as I wanted to immerse myself in paediatric research as soon as possible to solidify my decision to pursue this speciality in the future. I was extremely lucky to have A/Prof Kenneth Tan as my supervisor due to his extensive knowledge of statistical analysis and his role as a member of the Australian and New Zealand Neonatal Network. With his guidance, I was able to complete a systematic review and meta-analysis as part of my literature review, which formed the foundations for my thesis. He also offered for me to shadow him during his ward service in the Special Care Nursery and NICU at Monash Children's Hospital which was quite worthwhile.

The deadlines for the assessments could be met quite comfortably if you worked consistently throughout the year, which I highly recommend you do, and you'll have plenty of time to make the most of the year-long break from clinical placement. Overall, I'd encourage taking an honours year to introduce yourself into the realm of research and see if it will become an integral part of your clinical practice in the future.

ABSTRACT

Background

Bronchopulmonary dysplasia (BPD) is one of the major sequelae of prematurity that incurs a significant financial burden on the health care system. Home oxygen therapy (HOT) facilitates an early discharge home for infants with BPD while preventing the effects of chronic hypoxaemia associated with the disease. Globally, the rate of HOT for infants with BPD may be between 8-74%. The independent risk factors for an infant diagnosed with BPD being discharged on HOT may be gestational age <26 weeks' (GA), sepsis, antenatal steroids (AS), chorioamnionitis, patent ductus arteriosus (PDA) ligation and nitric oxide use (NO). However, there is a scarcity of Australian and New Zealand (ANZ) data that investigates the HOT rates and their independent risk factors. Our aim was to determine the temporal trends in the number of infants diagnosed with BPD in the ANZ population requiring HOT, and the maternal, neonatal and respiratory management risk factors for infants with BPD being discharged on HOT.

Methods

This was a retrospective epidemiological study that included infants <32 weeks GA admitted to NICUs that comprise the Australian and New Zealand Neonatal Network (ANZNN). We divided the population into three epochs (1995-2002, 2003-2012, and 2013-2022) to capture changes in respiratory management practices from the BOOST-I and BOOST-II trials. Time series graphs demonstrated the trends of the number and rates of neonatal mortality, BPD diagnoses, HOT for infants with BPD, ROP diagnoses and ROP Grade 3+ diagnoses.

Univariate analysis and a stepwise backwards hierarchical logistic regression model were used to obtain the crude and

adjusted odds ratios (ORs) of the variables that were likely to increase or decrease the propensity of an infant with BPD to receive HOT. A two-way table was created to investigate the effect of respiratory management techniques on the median hours of different ventilation methods.

Results

There was a negative association between neonatal mortality, which decreased over time, and the number of infants being discharged on HOT, which increased over time. There was a positive association between BPD diagnoses and HOT for infants with BPD, which both increased in number over time. Both the incidence of ROP and ROP Grade 3 or higher increased over the study period. Birth year (aOR=1.03 (1.00, 1.06)), IVH (aOR=1.26 (1.04, 1.52)), surfactant (aOR=1.48 (1.08, 2.01)) and postnatal steroids (aOR=2.23 (1.84, 2.71)) were likely to increase the risk of a BPD infant being discharged on HOT while GA (aOR=0.91 (0.84, 0.98)) was likely to decrease the risk. Postnatal steroids were associated with an increased duration of all ventilation techniques.

Conclusion

While I was able to analyse the trends and independent risk factors for an infant with BPD being discharged on HOT, further studies are required to investigate the effect of parent and clinician or NICU preference, which were not considered in my research due to a lack of data. These results may inform the ANZ public healthcare system about the projected costs associated with BPD and HOT and enable clinicians to appropriately counsel parents on the likelihood of their infant being discharged on HOT.

Pranathi Katneni

Objective Measurement of Pain Using Caudal Block or Local Anaesthetic Infiltration in Infants Undergoing Laparoscopic Inguinal Hernia Repair: A Randomised Controlled Trial

Supervisor Names and Institute Affiliations:

Dr. Maurizio Pacilli^{1,2}, A/Prof. Ramesh Nataraja^{1,2}

1. Department of Paediatrics, School of Clinical Sciences, Monash University

2. Department of Surgery, School of Clinical Sciences, Monash University



My name is Pranathi, and I chose to study my BMedSc(Hons) after my 4th year of medical school. I chose to complete a BMedSc(Hons) as I had never had any research experience before and I wanted to take the opportunity to learn as much as I could. Spending the whole year on research has allowed me to learn so many new skills on conducting a research project from start to finish and helped me develop new confidence.

I was lucky enough to be completing my BMedSc(Hons) in the Monash Children's Hospital Department of Paediatric Surgery. My supervisors and the research team were lovely and supportive and gave me endless opportunities for learning experiences. In addition to my Honours project, I had the chance to help out with other projects being run in the department, and broaden my experiences this year. This year has been an invaluable opportunity in developing my academic skills and learning more about the field of Paediatric Surgery.

If you are interested in completing a BMedSc(Hons), I am more than happy to be contacted to answer any questions about my experience at pkat0009@student.monash.edu

ABSTRACT

Background

Laparoscopic inguinal hernia repair (LIHR) is a common procedure performed in infants. Alongside use of general anaesthesia, regional techniques are frequently used to manage intraoperative and postoperative pain. These include caudal block (CB) (injecting local anaesthetic into the epidural space), and local anaesthetic infiltration (LAI) (local anaesthetic injected directly into the wound site). There is minimal research assessing pain in LIHR under CB compared with LAI in infants. In addition, assessing pain in infants poses challenges, often relying on subjective measures. The Newborn Infant Parasympathetic Evaluation (NIPE) monitor analyses heart rate variability to provide an objective measurement of pain and is validated for use in children aged 2 years and under.

Aims

This study aimed to compare intraoperative and postoperative pain in LIHR performed with CB or LAI, and to identify specific procedural stimuli contributing to pain. The findings are intended to inform targeted pain management and enhance perioperative care.

Method

This study was a randomised controlled trial involving infants aged 2 years and below who underwent LIHR. Patients were randomised by weight minimisation to receive either a CB prior to surgery, or LAI prior to skin incision and skin closure. The NIPE monitor was attached intraoperatively and postoperatively, with absolute NIPE indices (NIPEi) at specific intraoperative events recorded. The NIPE index ranges from 0-100, with lower values representing higher pain and scores below 50 indicating severe pain. Overall median NIPE indices (NIPEm) were calculated over the entire intraoperative period. A similar calculation was conducted for the postoperative

period. Group comparisons were performed with the Mann-Whitney test. A power calculation was performed using preliminary data from our unit, which compared CB with CB combined with LAI. The estimated sample size required to achieve statistical power at a significance of 0.05 was 70.

Results

At present, the study is under-powered, with a total of 14 participants undergoing LIHR included, with 8 randomised to CB and 6 randomised to LAI. Patient demographics were similar between the groups. The intraoperative NIPEm in the CB group was 69.00, slightly higher than the NIPEm of 64.00 in the LAI group. This difference was non-significant, indicating similar pain control between the two interventions. Intraoperatively, there were no significant differences in NIPEi at any intraoperative event except the first flank incision, in which the CB group had significantly higher NIPEi than the LAI group (58.00 vs 49.00, $p=0.0476$). There were no significant differences in postoperative pain between the groups with a NIPEm of 47.00 in the CB group, and 50.50 in the LAI group.

Conclusions

These preliminary results suggest that in infants undergoing LIHR, CB and LAI produced comparable results in overall intraoperative and postoperative pain. CB provided better cover of the first flank incision, but pain observed at other intraoperative events was similar between groups. This suggests that both CB and LAI might be effective regional anaesthetic techniques which produce similar pain outcomes. However, this study is currently under-powered, limiting the accuracy of conclusions. Larger studies are required to confirm these results

Hasna Kazi

Safety of Midodrine and Atomoxetine in the Treatment of Postoperative Hypotension and Evidence of Postoperative Sympathetic Dysfunction

Supervisor Names and Institute Affiliations:

A/Prof Jai Darvall, Dr Ned Douglas

Department of Anaesthesia and Pain Management, The Royal Melbourne Hospital

School of Public Health and Preventive Medicine, Monash University



Hi! My name is Hasna, and I completed a BMedSc(Hons) after my fourth year of medical school. I wanted to complete an honours year because evidence-based medicine is so important, and it is really the future of our profession. I was interested in doing an honours year but really wanted a project with clinical work, so when I saw the advertisement for this project I jumped at the chance

I am very grateful for the kindness, friendship and mentorship I experienced from the researchers and my supervisors at the Royal Melbourne Hospital. Thank you for making this year amazing.

I strongly encourage you to do an honours year if you want to see if a career in research is for you. There are so many skills you will learn, including critical thinking and writing, that will set you up well for your future, even if you don't continue in research. If you are interested in a project, make sure you meet with your supervisors and see if you gel with them as this dictates your experience for your year! Please feel free to email me at hkaz0001@student.monash.edu or on Facebook if you have any questions

ABSTRACT

Background

Postoperative hypotension is a common and harmful complication after surgery. Oral vasopressors midodrine and atomoxetine are currently being trialled to treat postoperative hypotension. Before adoption into clinical practice, side effects of hypertension and bradycardia must be evaluated as they can cause serious complications. We also sought to evaluate postoperative sympathetic dysfunction as a potential cause of postoperative hypotension.

Methods

This study was a nested, prospective cohort study within a double-blind, randomised trial comparing midodrine, atomoxetine and placebo in adult patients who were hypotensive after major non-cardiac, non-obstetric surgery. Co-primary outcomes were the incidence of bradycardia (heart rate [HR] < 60 bpm) and clinically important hypertension (systolic blood pressure [SBP] > 180 mmHg) within 72 hours of medication administration. Secondary outcomes were bradycardia at thresholds of HR < 50 bpm and < 40 bpm, and hypertension at SBP > 140 mmHg and > 160 mmHg. We investigated for evidence of sympathetic dysfunction including simultaneous bradycardia and hypotension, and orthostatic hypotension by reviewing clinical notes. The relationship between HR and SBP after surgery was investigated to determine duration of autonomic dysfunction postoperatively.

Results

We present a blinded analysis of the first 78 participants. Thirty-four (44%, 95%CI 33-55%) patients experienced bradycardia after trial drugs compared to 26 (34%, 95%CI 24-44%) patients who had bradycardia prior. While the trial drugs were associated with higher odds of bradycardia, this difference was not significantly different to having bradycardia before medications (OR = 3.0, 95%CI 0.91-12.76, p = 0.077). One (3%,

95%CI 0-15%) patient required medical treatment for bradycardia after receiving the trial drugs. One (1%, 95%CI 0-7%) patient had one episode of clinically important hypertension that did not require medical intervention.

Nine (12%, 95%CI 6-21%) and two (3%, 95%CI 1-9%) patients experienced a heart rate less than 50 and 40 bpm respectively. Thirty-three (42%, 95%CI 32-53%) patients experienced a SBP > 140 mmHg in the 72 hours after medication administration, for a total of 133 recorded episodes. This includes eight (10%, 95%CI 5-19%) patients who had a SBP above 160 mmHg, for a total of 16 readings.

Sixty-five (83%, 95%CI 74-90%) patients had simultaneous HR < 90 bpm and SBP < 90 mmHg, including 17 (22%, 95%CI 14-32%) patients with simultaneous HR < 60 bpm and SBP < 90 mmHg. Eleven (25%, 95%CI 15-39%) out of 44 patients tested for orthostatic hypotension were positive. These results may reflect autonomic dysfunction postoperatively. We did not find significant evidence that the relationship between SBP and HR changes over time.

Conclusion

While these analyses were blinded and thus results should be interpreted with caution, the low rates of clinically significant bradycardia and hypertension suggest that midodrine and atomoxetine may be safe oral treatment options for postoperative hypotension. While some patients did exhibit signs of autonomic dysfunction postoperatively, we did not find convincing evidence of sympathetic function changing over time following surgery. Future studies may compare the relationship between HR and SBP both pre-operatively vs postoperatively, and with patients who are not hypotensive after surgery.

Shakira Khansa Audie Kurniawan

Cytomegalovirus infection in seronegative lung transplant recipients

Supervisor Names and Institute Affiliations:

Dr Bradley Gardiner and Prof Glen Westall

Department of Infectious Disease – Alfred Health School of Translational Medicine



I'm Shakira Khansa Audie Kurniawan, a fourth-year medical student at Universitas Indonesia, who had the privilege of undertaking an Honours research year at Monash University, based at The Alfred Hospital. My project explored the prevention and management of Cytomegalovirus (CMV) infection in seronegative lung transplant recipients (D+/R-), a population facing significant post-transplant vulnerability.

I was drawn to this topic because it sits at the intersection of clinical medicine, immunology, and translational research, addressing a crucial question in improving graft and patient outcomes. Throughout this year, I gained not only technical and analytical research skills but also a deeper understanding of host-virus interactions, antiviral prophylaxis strategies, and immune monitoring.

This experience has shaped my passion for evidence-based medicine and strengthened my aspiration to bridge research and clinical practice to enhance patient care.

ABSTRACT

Background

Lung transplantation offers a vital lifeline for individuals with end-stage lung disease, yet its promise is often shadowed by the persistent threat of infection, particularly from Cytomegalovirus (CMV). For seronegative recipients receiving organs from seropositive donors (D+/R-), this challenge is amplified, posing a significant risk to both allograft integrity and patient survival. These patients are highly vulnerable to primary CMV infection due to a lack of pre-existing immunity and the profound immunosuppression required post-transplant. While antiviral prophylaxis is widely used in this population, the optimal duration is unclear. Novel CMV-specific immune assays such as the QuantiFERON-CMV (QF-CMV) are now available but there is limited data on their use in D+/R- lung transplant recipients.

Method

This retrospective cohort study aimed to: (1) define the frequency and severity of CMV infection in D+/R- lung transplant recipients, (2) assess the efficacy of extended antiviral prophylaxis, and (3) describe the acquisition of CMV-specific immunity in D+/R- in lung transplant recipients.

Results

Our cohort included 91 adult lung transplant recipients. Median age was 58 years, 55/91 (60%) were male and 84/91 (92%) underwent bilateral lung transplantation. Despite a median 11-month course of antiviral prophylaxis, a substantial proportion of D+/R- lung transplant recipients (69/91, 76%) developed primary CMV infection, with nearly half (39/91, 43%) experiencing subsequent recurrence. Primary infections often presented with

considerable symptomatic burden and adverse clinical outcomes, while recurrent episodes were frequently associated with lower viral loads and a more asymptomatic profile. Notably, prolonged valganciclovir prophylaxis (≥ 12 months) was associated with a significantly reduced incidence and delayed onset of CMV infection (OR=0.07; 95% CI: 0.01-0.33; $p=0.002$). The QF-CMV assay's practical utility during primary prophylaxis was limited because most D+/R- recipients failed to mount detectable responses. A robust CMV-specific immune response was most consistently observed after CMV infection. Furthermore, the multivariate analyses in this study identified three independent factors significantly associated with post-transplant CMV status: the duration of valganciclovir prophylaxis, recipient ABO blood group, and donor brain death etiology.

Conclusions

This study illuminates the enduring struggle against CMV in lung transplantation, particularly for D+/R- recipients. It advocates for extended antiviral prophylaxis as a cornerstone of protection and the need for greater understanding of the development of the CMV-specific immune response to enable antiviral cessation without severe CMV infection. While QF-CMV assays offer valuable insights post-prophylaxis, their role remains constrained in immunologically naive recipients. Future prospective studies should explore integrative risk models incorporating virological, immunological, and clinical data to optimize CMV management and improve transplant outcomes.

Bhavesh Nico Lalwani

Validation of Uncertainty Quantification in AI-Derived Liver PDFF Measurements Using MRI.

Supervisor Names and Institute Affiliations:

Prof Sergio Uribe

Dr. Juan Pablo Meneses

Department of Medical Imaging and Radiation Sciences, School of Primary and Allied Health Care.

Faculty of Medicine, Nursing and Health Sciences, Monash University.



Hey everyone! I'm Bhavesh and I have completed my BMedSc(Hons) year at Monash Biomedical Imaging in 2025. My honours project involves validating an uncertainty-aware artificial intelligence model for quantifying fat in the liver. This learning journey has been a wonderful experience, the challenges I have faced and the new skills I have learned has contributed to my personal growth and development.

Before doing my research in this department, I had no experience in artificial intelligence and MRI. With the guidance and support of my supervisors, I was able to learn many concepts and developed a strong interest in both fields. Through collaboration and countless discussions with my supervisors, I was able to develop critical thinking as well as several technical and research skills. This journey has been rewarding and memorable, I would also like to thank my supervisors for their continuous support and guidance throughout this project.

Feel free to contact me if you have any questions! (bhaveshnico@gmail.com)

ABSTRACT

Background

Metabolic Associated Steatotic Liver Disease (MASLD) is the most chronic liver disease, affecting more than 30 percent of the world population. MRI is considered to be the non-invasive gold standard for diagnosing this condition. Among various MRI techniques, Proton Density Fat Fraction (PDFF) has emerged as an established biomarker of liver fat content. However, accurate PDFF quantification is confounded by certain challenging scenarios such as low SNR, magnetic field inhomogeneities, elevated $R2^*$, leading to artifacts such as water-fat swapping. With the aid of AI-DEAL, an artificial intelligence model that is computationally efficient and incorporates uncertainty quantification, more precise and reliable PDFF estimates can be obtained.

Method

This study validated the PDFF uncertainty estimates by conducting in-vivo and in-silico experiments. The in-silico experiment involved the use of a digital phantom built from a real anatomy of a 24-year-old woman. Using the phantom, simulations were conducted through the manipulation of $R2^*$ and SNR across three different PDFF levels (low, medium and high) forming 51 unique simulated cases with known ground truths. The in-vivo experiment included multi-echo CSE-MRI liver scans of 40 healthy/hepatic steatosis subjects. All data was processed using the AI-DEAL framework and ROI measurements were conducted in MATLAB. Both experiments evaluated AI-DEAL generated uncertainty predictions in a set of challenging imaging scenarios using correlation and regression analysis.

Results

The in-silico experiment highlighted an association between AI-DEAL's variance estimates against SNR ($R^2 = 0.99, 0.99, 1.0$), $R2^*$ (0.4, 0.54, 0.98) and off-resonance (0.99, 0.99, 1.0) for all three PDFF levels. Under the best-case simulation scenario ($R2^* = 30 \text{ s}^{-1}$, background susceptibility = 15, SNR = 100), smaller estimated errors were observed at higher PDFF levels. A strong association was also highlighted between PDFF absolute error with SNR ($R^2 = 0.99, 1.0, 1.0$) and $R2^*$ ($R^2 = 1.0, 0.99, 0.99$) for all three PDFF levels. In-vivo experiment showed no association between AI-DEAL's variance estimates for $R2^*$ and SNR, yet displayed a strong relationship with off-resonance ($R^2 = 0.7768$). A possibility of a 5% threshold is highlighted, suggesting results below this level is considered acceptable, while results above 5% are deemed questionable.

Conclusions

AI-DEAL based uncertainty estimation successfully quantifies the reliability of the resulting liver PDFF estimations. Incorporating both in-silico and in-vivo validation on the model's uncertainty quantification demonstrates robustness across distinct $R2^*$, SNR and field inhomogeneities. These findings suggest that implementing uncertainty aware models for liver MRI-PDFF quantification will enhance the trust and reliability of the measurements.

Raymond Lu

Functional Survey of Immunomodulators using in vitro Tumour Models of Cancer Immunotherapy

Supervisor Names and Institute Affiliations:

Dr Miles Andrews

Dr Jessica Da Gama Duarte

Department of Medicine- Alfred, School of Translational Medicine



Between my 4th and 5th year of medicine, I decided to pursue a lab-based Honours project at the School of Translational Medicine, studying the effect of immunomodulators on melanoma cell lines. I particularly wanted to pursue this project as I am interested in the field of medical oncology, but I also wanted to take some time out of my clinical years to see what the process of research in the lab is like.

Coming into the year as a student with minimal lab experience was daunting. However, with the support of my supervisors, I was able to pick up a variety of valuable skills, both inside and outside of the lab. Despite being very challenging at times, I am grateful for the skills I have learnt.

For anyone looking to pursue an Honours project, I would be happy to be contacted by email: rluu0010@student.monash.edu.

ABSTRACT

Background

The discovery of immunotherapies has vastly transformed the landscape of cancer treatment and has greatly contributed to tackling Australia's growing cancer burden. Immune checkpoint inhibitors (ICI) are currently the most widely used class of immunotherapies and have been shown to provide distinct benefits over traditional chemotherapy and/or molecular targeted therapy in many malignancies thus have become quickly implemented into clinical practice following their discovery. Despite this, patients who receive ICI therapy often experience unwanted tissue damage known as immune related adverse events (irAEs), which are debilitating and can become life-threatening. Mechanisms that drive irAE manifestation are largely unknown; therefore, clinicians tend to manage irAEs using empirical immunomodulators, with no mechanistic basis to support immunomodulator choices. Whilst the mechanisms of action of immunomodulators in immune cells has been extensively studied, the potential for these drugs to affect cancer cell function has not. Some immunomodulators may potentially act synergistically with ICIs to inhibit cancer cell function whilst simultaneously attenuating irAEs; knowledge of this may allow for enhanced personalisation of irAE treatment, in turn optimising treatment outcomes.

Methods

A survey of immunomodulators used in irAEs was conducted on melanoma cell lines in

vitro, aiming to assess immunomodulator effects on cellular functions imperative to survival. LM-MEL-64, LM-MEL-1a, and A375 human melanoma cell lines were cultured and treated with immunomodulators of various drug classes (glucocorticoids, antimetabolites, calcineurin inhibitors, JAK inhibitors, mTOR inhibitors) with functional assays (MTS, scratch migration, Annexin V/ Propidium iodide (PI) apoptosis and colony formation) then performed.

Results

Of the drug classes examined the glucocorticoids and calcineurin inhibitors particularly did not demonstrate statistically significant dose-response effects on melanoma cell function. Methotrexate (an antimetabolite), however, demonstrated at least one instance of a statistically significant dose-response effect across all functional assays. Methotrexate exerted antiproliferative effects in LM-MEL-64 and LM-MEL-1a (One-way ANOVA $p=0.0012$ and $p=0.0042$ respectively), suppressed migration in LM-MEL-64 (Two-way ANOVA time x treatment interaction $p=0.0175$), and was pro-apoptotic in LM-MEL-1a (One way ANOVA $p<0.0001$).

Conclusions

As a result of this study, future in vivo work should prioritise the study of anti-metabolites (particularly methotrexate), with findings potentially validating their use as a beneficial treatment option over other immunomodulators for patients experiencing irAEs.

Nisuli Manamperi

The Association between PID-5 Personality Trait Domains and Quality of Life in People with Epilepsy

Supervisor Names and Institute Affiliations:

Emma C. Foster PhD FRACP1,3, Terence J. O'Brien MD FRACP1-4, Patrick Kwan PhD FRACP1-5, Zhibin Chen PhD1,4,5, Toby T. Winton-Brown PhD FRANZCP1,6

1. Department of Neuroscience, School of Translational Medicine, Monash University, Melbourne VIC 3004, Australia
2. Department of Neurology, The Royal Melbourne Hospital, Parkville VIC 3052, Australia.

3. Department of Neurology, Alfred Health, Commercial Road, Melbourne VIC 3000, Australia.

4. Department of Medicine, The University of Melbourne, Parkville VIC 3050, Australia.

5. School of Public Health and Preventive Medicine, Monash University, Melbourne VIC 3000, Australia.

6. Department of Psychiatry, Alfred Health, Commercial Road, Melbourne VIC 3000, Australia.



Hi, I'm Nisuli and I completed my BMedSc(Hons) in 2025. I've always been interested in both medicine and psychiatry, and this Honours year gave me the chance to explore an intersection of both those fields. I was fortunate enough to be supervised by Dr Emma Foster, who was incredibly supportive of my interests and encouraged me throughout the entire process.

Throughout the year, I gained valuable research skills, particularly in critical thinking and in statistical analysis, the latter of which I had little prior experience with. This year has been a fantastic opportunity to explore an area of interest in a supportive and productive environment. Although it was a change from the clinical environment I had grown accustomed to, this year has given me so much appreciation for how much time, thought, and effort goes into every piece of research we read and has definitely strengthened my motivation to be involved in research beyond Honours.

My main advice for future students is to find a team and supervisor who really support your goals and what you want to get out of the year, as it truly made a world of difference for me. I'm happy to be contacted if you have any questions (nisuli1292@gmail.com)

ABSTRACT

Background

Epilepsy may profoundly impact a person's quality of life (QOL), driven by factors including mood disorders and seizure severity. The association between personality traits and QOL in people with epilepsy is comparatively less understood. Personality describes an individual's patterns of thoughts, feelings and behaviours and shapes how they engage with medical care. Although these traits are considered biologically based and relatively stable, understanding the way personality influences medication adherence, commitment to follow-ups, clinical outcomes and overall QOL can help clinicians deliver improved person-centred care. While previous research has explored various heterogenous personality traits in relation to QOL in people with epilepsy, few studies have used the comprehensive and standardised framework provided by the Personality Inventory for DSM-5 (PID-5), which outlines five maladaptive traits. The trait domains of negative affectivity, detachment, antagonism, disinhibition and psychoticism are not psychopathological but are clinically relevant. We aimed to characterise the association between PID-5 maladaptive traits and QOL in people with epilepsy.

Methods

Adult patients admitted for inpatient video-electroencephalographic monitoring completed several psychometric instruments, including the PID-5, the epilepsy-specific QOL instrument the Quality of Life in Epilepsy Inventory (QOLIE-89) and the generic QOL instrument, EuroQOL 5-Dimension 3-Level (EQ5D3L). Univariable and multivariable analyses assessed the association between PID-5 traits and each QOL measure. Confounders were screened from demographic, clinical and psychometric variables, including the Neurological Disorders Depression Inventory for Epilepsy

(NDDI-E), the Generalised Anxiety Disorder scale (GAD-7) and the Liverpool Adverse Events Profile (LAEP). All relevant covariates were included to control for confounding, and multicollinearity was assessed using variance inflation factors. Results were reported as standardised beta coefficients with 95% confidence intervals.

Results

A total of 332 patients met inclusion criteria; the mean age of the sample was 38.3 years and 51.5% of the sample were female. Single-factor analysis revealed that increases in all PID-5 traits were significantly associated with both lower QOLIE-89 and EQ5D3L scores. Age, sex, risk of depression, risk of anxiety and degree of adverse events were all significantly associated with at least both a PID-5 trait and a QOL outcome and were included for secondary analysis in the multivariable models. Following adjustment, increased detachment was associated with low QOLIE-89 (ROM = 0.928, 95% CI = 0.896, 0.961, $p < 0.001$) and low EQ5D3L Visual Analogue Scale scores (ROM = 0.896, 95% CI = 0.826, 0.972, $p = 0.008$), increased disinhibition was associated with low QOLIE-89 scores (ROM = 0.943, 95% CI = 0.902, 0.987, $p = 0.011$) and increased psychoticism was associated with low QOLIE-89 scores (ROM = 0.957, 95% CI = 0.919, 0.999, $p = 0.044$).

Conclusions

The findings of this study reveal that PID-5 maladaptive traits are associated with poorer QOL outcomes in people with epilepsy and that some of these associations remain significant when we controlled for clinicodemographic factors. Given the incidence of psychiatric comorbidity in people with epilepsy and the association between depressive and anxious disorders and poor QOL, assessing personality in epilepsy settings may help clinicians identify patients at greater risk of impaired QOL.

Eleanor McLean

Proteomic Identification of Targets for Antibody-Drug Conjugates in Paediatric Cancers

Supervisor Names and Institute Affiliations:

Professor Ron Firestein

Dr Paul Daniel

Hudson Institute – Centre for Cancer Research



Hi! My name is Eleanor, and I completed my BMedSc(Hons) after completing my fourth year of Medicine. I wanted to explore the research side of medicine and understand how scientific discovery translates into clinical practice. This year has allowed me to develop valuable research skills and gain a deeper appreciation for the people and collaboration behind every scientific advance. It has been a rewarding experience that strengthened both my technical and critical thinking skills.

ABSTRACT

Background

Cancer is a leading cause of death in children, with survival rates for high-grade solid tumours such as the rare soft tissue sarcoma chordoma, showing little improvement over the past few decades. The current standard-of-care treatments used in chordoma involve surgical resection and proton beam therapy however, these are ineffective with over half of all patients experiencing recurrence. In addition, the use of radiotherapy for childhood patients, especially in regions close to the CNS such as clival chordomas, has a high chance of causing devastating, lifelong side-effects in young patients. Antibody-drug conjugates (ADCs) are “targeted-chemotherapies” comprised of an immunoglobulin conjugated to a cytotoxic payload and are a type of precision medicine which offers the promise of anti-tumour effects whilst reducing toxicity. The use of ADCs has expanded to childhood haematological cancers; however their use in paediatric solid tumours has thus far been limited by a scarcity of known cell-surface targets. To address this, we leveraged the recent completion of whole cell proteomics from the Childhood Cancer Model Atlas to identify novel ADC targets for chordoma.

Our screen identified two candidate proteins: CD70 and DSG2. We confirmed their surface expression in vitro across seven chordoma cell lines, observing heterogeneous CD70 expression and consistently high DSG2 expression. However, evaluation of the ability for these cell surface proteins to internalise upon binding immunoglobulins revealed that only CD70 was efficiently trafficked into the cell, establishing it as the better candidate for targeting by ADC-based therapies. We then demonstrated the efficacy of common ADC payloads (MMAE and camptothecin) across our cell line cohort. Building on this data, we constructed a modular ADC-like molecule targeting CD70 with the conjugated payload MMAF. Evaluation of this ADC-like therapeutic confirmed that CD70 was an effective ADC target as we observed dose-dependent targeted cell death that correlated directly with CD70 expression levels. Together, these preclinical findings establish CD70 as a compelling therapeutic target in chordoma and support further development of CD70 ADC therapies for this devastating cancer.

Elise McLeod

WatchPAT as a Diagnostic Device for Obstructive Sleep Apnoea in Children

Supervisor Names and Institute Affiliations:

A/Prof Gillian Nixon 1,2

Dr Lauren Nisbe t1,2

1. Department of Paediatrics, Monash University, Melbourne, Australia

2. Melbourne Children's Sleep Centre, Monash Children's Hospital



Hey everyone, I'm Elise and I completed 4C in 2024 before starting a BMedSc(Hons) year in 2025. By the end of fourth year, I knew I was interested in Paediatrics, but I wasn't yet sure what direction I wanted my career to take. I also knew I wanted research to be part of it. So, I decided that a structured research year during my university years would be a great way to build skills and confidence for future projects. I was keen to do a clinical project and came across one in paediatric sleep medicine—a subspecialty I knew little about but was curious to explore. This year has provided an amazing opportunity for both academic and personal growth. It is helped me overcome my fear of the unknowns of the world of research and given me the confidence to pursue it further. It has also given me more time and energy to focus on passions outside of medicine. I would recommend chatting with various supervisors and their past students before choosing your project. Feel free to reach out if you have any questions on Facebook or by email (emcl0011@student.monash.edu).

ABSTRACT

Background

Obstructive sleep apnoea (OSA) is a prevalent condition in children with significant morbidity if untreated, highlighting the importance of early diagnosis and management. Overnight in-laboratory polysomnography (PSG) is the gold-standard diagnostic modality. However, PSG is limited by accessibility, tolerability, cost and labour requirements. Therefore, abbreviated testing modalities may offer a potential solution. The WatchPAT-300 (WP300) is an example of one such device currently licensed for use in children ≥ 12 years. WP300 uses peripheral arterial tonometry (PAT) to measure sympathetic changes following obstructive events during sleep. The few existing validation studies comparing the use of WatchPAT to PSG in children are limited by poorly described methodology, inconsistent results and little data in children < 12 years. Therefore, this project aimed to address the research gap with a rigorous study design and inclusion of children < 12 years.

Methods

100 children aged 8 to 18 years referred for diagnostic PSG at Melbourne Children's Sleep Centre were recruited and underwent concurrent WP300 studies. Children were excluded if using medication that may affect PAT signal, had significant co-morbidities, a cardiac pacemaker or sustained arrhythmia, or if the WP300 finger probe did not fit securely. PSG data were manually analysed and reported according to international standards, while WP300 studies were analysed automatically using proprietary software. Time-synched WP300 and PSG respiratory events were directly compared in a subgroup.

Results

Twenty-one children were excluded from analysis due to poor tolerance and/or

poor-quality data, resulting in 79 included children (40 children 8 to 12 years, 39 children 12 to 18 years; median age 12.2 years; 42% female). Demographic and baseline PSG parameters did not differ between included and excluded participants ($p > 0.05$). There were significant differences in most sleep and respiratory variables compared between WP300 and PSG. WP300 significantly overestimated total sleep time, rapid-eye movement sleep and the obstructive apnoea-hypopnoea index (OAHl), and underestimated %N1/N2 sleep (all $p < 0.001$). No significant differences were seen between age groups. At an OAHl of ≥ 1 events/h, WP300 yielded a high false positive rate (specificity 14%), reducing at an OAHl of ≥ 5 events/h (specificity 75%). False negative rates were consistently low (negative predictive values of 100% and 98% at each threshold). While PSG diagnosed 64% of children with OSA, 95% of children were diagnosed by WP300. When WP300 respiratory events were individually compared to PSG, 64% did not correspond with any respiratory event or arousal on PSG. The frequency of corresponding respiratory events increased with disease severity.

Conclusion

Our study demonstrated inferior diagnostic performance and poorer tolerance of WP300 compared to PSG. WP300's propensity to over-diagnose OSA in a clinically referred population means most children would require follow-up diagnostic PSG. Given the high sensitivity and negative predictive value, WP300 may be useful in screening populations with a low risk of OSA, for example, community samples. At an OAHl of ≥ 5 events/h, WP300 may be useful for triaging ENT surgical waiting lists and reducing unnecessary surgeries. Further research to develop a paediatric-specific algorithm for analysing WP300 studies may help improve its diagnostic accuracy in children.

Rhea Nandurkar

Mammographic Predictors of Cardiovascular Disease

Supervisor Names and Institute Affiliations:

Associate Professor Nitesh Nerlekar 1,2

Associate Professor Andrew Lin 1,2

1. Victorian Heart Institute

2. Victorian Heart Hospital

Sub-Faculty of Clinical and Molecular Medicine, Monash University



Hi! My name is Rhea and I chose to complete a BMedSc(Hons) following my fourth year of medicine. After two years of placement, I was eager to learn more about the research practices which underpin clinical practice. My growing interest in Cardiology led me to complete my Honours year at the Victorian Heart Hospital (VHH).

My year at the VHH was thoroughly enjoyable and offered a wide range of clinical and research learning opportunities. Throughout this year, I have gained invaluable research skills in statistics, coding and scientific writing, which I will carry forward into the rest of my career. None of this would have been possible without the endless guidance and support provided by my supervisors to whom I am extremely grateful. This year has certainly inspired in me a passion to pursue medical research alongside clinical medicine and I would highly recommend a BMedSc(Hons) at the VHH to any prospective students.

I am more than happy to be contacted at man0011@student.monash.edu.

ABSTRACT

Introduction

Cardiovascular disease (CVD) remains the leading cause of mortality amongst women globally. Current risk prediction algorithms underperform in female patients. Mammography is now being considered a potential personalised imaging tool for additional CVD risk stratification. The mammographic parameters of low breast density and breast arterial calcification (BAC) are independent emerging biomarkers of CVD presence. Low breast density is indicative of greater fatty breast tissue and represents metabolic risk, and BAC is representative of vascular calcification and atherosclerotic risk. The association between these combined parameters and incident major adverse cardiovascular events (MACE) is yet to be examined.

Aims

We aim to evaluate both the independent and joint associations of low breast density and BAC with incident MACE. We also aim to assess whether these parameters demonstrate incremental prognostic information for incident MACE beyond conventional risk tools alone.

Methods

Retrospective cohort study including women >40 years old undergoing breast cancer screening mammography (index mammogram between 2005–2020). Mammograms were analysed using an artificial intelligence algorithm for BAC detection (present/absent). Breast density was assessed visually and graded by standard criteria (high or low density). The primary outcome was incident MACE, defined as a composite of all-cause

mortality, ischaemic heart disease, stroke and heart failure as determined from electronic health records. Time-to-first-event was performed for survival analysis, and calibration statistics performed for reclassification assessment. Models were adjusted for the prevalence of traditional CVD risk factors and use of preventative therapies.

Results

We included 22,285 participants (mean age 55 ± 12), of whom 5,413 (24.3%) had BAC and 8,024 (36%) had low breast density. Over a mean follow-up of 4.05 ± 3.16 years, 1,964 MACE were recorded. Presence of either low breast density (hazard ratio (HR) 1.67, 95%CI 1.53-1.84, $p < 0.001$) or BAC (HR 2.49, 95%CI 2.28-2.73, $p < 0.001$) were significant independent predictors of incident MACE. The combined presence of low breast density and BAC was associated with incident MACE (HR 3.70, 95%CI 3.25-4.21, $p < 0.001$). The addition of combined breast density and BAC to standard CVD risk scores significantly improved the discrimination for MACE (C-statistic 0.67 to 0.71). Among individuals classified as low cardiovascular risk, the addition of both breast parameters resulted in an upward net reclassification index of 12%.

Conclusion

Low breast density and BAC independently associate with incident MACE and an increased risk signal is noted with their combined presence. The greatest incremental improvements in risk prediction are seen with the consideration of both breast parameters concurrently. Low breast density and BAC serve as novel biomarkers of CVD, lending mammography to be a useful adjunct in cardiovascular screening.

Logetha Nanthakumaran

Paediatric Early Warning Scores in the Emergency Department.

Supervisor Names and Institute Affiliations:

Dr Adam West and Prof Simon Craig, Monash Children's Hospital Emergency Department



Hi, I'm Logetha and I completed my BMedSc(Hons) year with the Monash Children's Hospital Emergency Department between my fourth and fifth year of medical school.

I specifically chose this department and my supervisors because the project was something we would conceptualise together – it wasn't a pre-designed project. That gave me the unique opportunity to build my project entirely around what interested me. I designed the outline from scratch, watched it evolve through my literature review, and followed new directions as interesting findings emerged. Having my supervisors support me through the intellectual journey of shaping my research made the experience extremely fulfilling.

For future students, doing a retrospective data-based project gave me a lot more flexibility. It gave me freedom not only in my hours but also in the direction I wanted my research to take. It also gave me the time and opportunity to work overseas and explore my personal hobbies.

Feel free to reach out if you'd like to chat more. I'm on Facebook or you can email me at lnan0003@student.monash.edu.

ABSTRACT

Background

Paediatric Early Warning Scores (PEWS) are used as an objective measure of clinical deterioration in inpatient and emergency department (ED) settings; however, there is limited consensus on which PEWS model best identifies a deteriorating child. Despite international studies comparing the predictive value of different PEWS, there is limited evidence evaluating Australian models, which include two subtypes: triggering and hybrid model (cumulative score +/- triggering thresholds) PEWS. The aim was to compare the performance of seven Australian PEWS models, one from each state and territory (three hybrid and four triggering), in predicting ICU and inpatient admission in a paediatric ED population.

Method

This was a retrospective observational study conducted in a tertiary ED at Monash Children's Hospital, Melbourne, Australia. We collected the initial set of vital sign observations recorded in the ED from patients aged seventeen years and younger, over a four-year period from Jan 1, 2021, to Dec 31, 2024. Patients transferred to another hospital were excluded. Univariate and multivariate logistic regression analysis was used to develop areas under the receiver operating characteristic (AUROC) curve analyses.

Results

We evaluated the performance of the PEWS in 164,671 paediatric patients of which 1,405 patients were admitted to the ICU and 50,621 were admitted as an inpatient, including short stay admissions.

The AUROC for the univariate analysis in predicting ICU admission, ranged

from 0.61 (95% Confidence Interval [CI]: 0.60-0.63) to 0.69 (95% CI: 0.68-0.71). For multivariate logistic regression models adjusted for triage category, the AUROC for predicting ICU admission ranged from 0.84 (95% CI: 0.83-0.85) to 0.85 (95% CI: 0.84-0.86). The AUROC for the univariate analysis in predicting inpatient admission ranged from 0.53 (95% CI: 0.53-0.53) to 0.59 (95% CI: 0.58-0.59).

For ICU admission, hybrid PEWS demonstrated sensitivity ranging from 0.45-0.60 and specificity from 0.70-0.78, compared to triggering PEWS with a sensitivity of 0.28-0.36 and specificity of 0.93-0.96. For inpatient admission, the hybrid PEWS showed a sensitivity of 0.35-0.51 and specificity of 0.63-0.80, while triggering PEWS showed a sensitivity from 0.09-0.14 and specificity from 0.96-0.97. Only the multivariate adjusted model predicting ICU admission achieved both high sensitivity and specificity: hybrid PEWS ranged from 0.74-0.76 (sensitivity), 0.81-0.82 (specificity) and for triggering PEWS it ranged from 0.74-0.75 (sensitivity) and 0.81 (specificity).

Conclusions

PEWS demonstrated moderate performance in predicting ICU admission and limited utility in predicting inpatient admission. Across all analyses, most hybrid PEWS achieved higher AUROC values than triggering PEWS. While triggering PEWS had a high specificity but low sensitivity, hybrid PEWS had a more balanced performance with a higher sensitivity and lower specificity. This research highlights the strengths and weaknesses of each PEWS system and may help inform future discussion in optimising PEWS in the paediatric ED.

Tonderai Ndoro

What is the impact of a cast slip on the treatment outcomes of Congenital Talipes Equinovarus with the Ponseti Method

Supervisor Names and Institute Affiliations:

Mr Brian Loh, Dr Brooke Adair, Melanie Toy-Laing, David Harding
(Monash Children's Hospital, Paediatric Orthopaedics Department)



Hello, my name is Tonderai and I had the exciting opportunity of undertaking an Honours project in 2025. After completing 4C in 2024, I was eager to take a break from standard clinical rotations to explore the world of research and pursue my broader interests.

With a growing curiosity into the area of Paediatric Orthopaedics, I chose a project in this field to gain a deeper understanding of the speciality and its foundations, whilst also developing skills in research design and scientific writing.

This year has been a rollercoaster of learning, from navigating ethics approval and conducting a comprehensive literature review to performing statistical analysis and refining my academic writing with no prior experience. These are invaluable lessons I may not have gained without taking the Honours year.

If you are interested in learning more about the Honours year at Monash Children's Hospital or my experience within the Orthopaedic Department, feel free to contact me at tndo0001@student.monash.edu.

ABSTRACT

Background

Congenital Talipes Equinovarus (CTEV) is a paediatric foot deformity that is prevalent within many communities worldwide and has the potential to cause significant morbidity if left untreated. Initially, it is effectively managed with the Ponseti Method; however, relapse is a common occurrence. The exact causes of relapse are unknown but cast slippage is a procedural complication that may lead to higher rates of relapse. Despite the clinical and anecdotal consensus, limited evidence exists on the longer-term impacts of a cast slip and what underlying factors may cause it to occur. This study was developed to investigate the association between cast slippage, treatment success and relapse rates in patients with CTEV managed at a tertiary paediatric hospital. The secondary aim was to explore the correlation between atypical foot features and the likelihood of a cast slip.

Method

A retrospective cohort study was conducted using data from Monash Children's Hospital for patients seen between 2010-2014. Patients diagnosed from birth to one-year-old with typical, atypical or complex idiopathic CTEV that were treated exclusively using the Ponseti Method were included. Data were analysed unilaterally, with a cast slip down the leg defined as a visually recognisable cast migration. The primary outcome was treatment success, as defined by the clinical criteria used by the treating clinicians at the conclusion of treatment. Feet which did not meet at least one of these criteria were deemed to have a residual deformity. Relapse was also assessed, which was described as a recurrent deformity requiring further intervention after successful initial Ponseti treatment. Statistical analysis was performed using Fisher's exact test, the

Mann-Whitney U test and multivariable logistic regression.

Results

A population of 66 patients were included, resulting in a cohort of 93 feet. Cast slippage occurred in 14 feet (15.1%), of which 10 feet (71.4%, $p=0.039$) remained with a residual deformity revealing a significant association. (OR=3.87, 95% CI: 1.12-13.34). There was no relationship identified between cast slippage and relapse. Cast slippage was strongly associated with atypical features (OR=9.50 95% CI: 2.42-37.32). In the 14 feet with a cast slip, 11 feet (78.6%) displayed features of atypia compared with 27.8% in the non-cast-slip group. In a multivariable analysis, the features of treatment resistance (OR=19.59, 95% CI 1.82-211.27) and tibialis anterior imbalance (OR=12.607, 95% CI 1.45-109.32) were the most significant predictors of poorer long-term outcomes.

Conclusions

In this cohort study, cast slippage during treatment using the Ponseti Method did not appear to correlate with an increased risk of relapse or inferior treatment outcomes. Poorer outcomes (Residual deformity and relapse) with this method were more commonly observed in patients with atypical features. These findings suggest that a cast slip might indicate the foot is not a typical clubfoot but rather an atypical foot with a higher probability of residual or recurrent deformity. Early recognition of any atypia is important to guide treatment and facilitate more effective therapy. Ultimately, larger studies with standardised scoring systems are needed to validate these findings and help refine and improve the current methodology to treat CTEV.

Caroline Nguyen

Impedance as a Biomarker: Interpreting Tissue Changes in Cochlear Implant Recipients

Supervisor Names and Institute Affiliations:

A/ Prof. Debra Phyland¹, Dr. Tayla Razmovski², Prof. Stephen O'Leary^{2,3}

1. The Department of Otolaryngology, School of Clinical Sciences (Monash Health), Monash University;

2. The Department of Otolaryngology, The University of Melbourne; and

3. The Royal Victorian Eye and Ear Hospital, Victoria, Australia



Hearing loss can significantly impact our relationships and quality of life. I found the medicine behind treating hearing loss interesting and chose an Honours project in cochlear implantation. My project investigated electrical impedance as a biomarker for tissue changes after cochlear implants.

My Honours year was fantastic. I collected clinical data during cochlear implant surgeries for my study; I had opportunities to discuss patients' hearing loss with them, spend time in the theatre, and collaborate with cochlear-implant researchers. During my Honours study, I learnt new skills in writing a literature review, analysing data in R, and synthesising my reading and results into a concise thesis.

My favourite part of the year was becoming familiar with a niche area of study. Towards the end of the year, I became more comfortable with reading and understanding new articles on my topic. The toughest part was navigating the unpredictable technological and bureaucratic challenges of research. Regardless, my supervisors supported me throughout each process.

ABSTRACT

Background

Cochlear implantation can result in insertion trauma to important cochlear structures and inflammation. Electrical impedances are used in cochlear implants to detect electrophysiological changes to the electrical environment within the implanted cochlea. One method of impedance measurements, monopolar impedances, is significantly affected by cell and protein artefacts on the electrode surface. A different impedance technique, 4-Point Impedance (4PI), has been recently identified as a potential biomarker of inflammatory processes and cell recruitment to the surrounding perilymph fluid of the cochlea. Both changes at the electrode surface and in the surrounding fluid may contribute to later fibrosis and subsequent loss of acoustic hearing.

Methods

This study identified electrode surface changes in the early post-operative period by measuring changes in a subcomponent of monopolar impedance, polarisation impedance (Z_p), using the electrochemical impedance spectroscopy technique. Changes in the surrounding deeper tissues were measured using 4PI. Z_p and 4PI data were compared to examine the possible association between cellular changes at the electrode surface and those in the

deeper tissues.

Results

Z_p and 4PI data were collected intra-operatively and at 1-day post-operation in 16 participants. Z_p increased by 97% (95%CI: 82 – 113%) from operation to 1-day post-operation, and 4PI increased by 46% (95% CI: 18 – 74%). Z_p increase was similar across the electrodes, whereas 4PI increase was greater in the basal and middle regions. There was no association between the percentage changes in Z_p and 4PI from operation to 1-day in this study.

Conclusion

The rise in Z_p and 4PI at 1-day post-operation suggests that impedance measurements may be indicators of intra-cochlear changes in the early post-operative period. This study is consistent with the literature, suggesting that Z_p and 4PI may identify cellular changes in different intracochlear regions relative to the electrodes. This study highlights that cellular processes during acute inflammation in the local perilymph may not be driving the changes at the electrode surface from operation to 1-day after operation.

Larasati Tiara Rachim

Secondary Prevention of Stroke in Patients with a Suspected Transient Ischaemic Attack

Supervisor Names and Institute Affiliations:

Professor Biswadev Mitra

Emergency Research Unit, School of Public Health and Preventive Medicine Alfred Health



My name is Tiara, and I have recently completed my Honours project on Transient Ischaemic Attack (TIA), focusing on the secondary prevention of recurrent stroke in patients with suspected TIA. I chose this project because of my strong interest in neurology and acute care, and the vital role of early TIA management in preventing future strokes.

Throughout the Honours year, I developed skills in critical appraisal, evidence-based research, and academic writing. The clinical experience I gained during this time was also exciting and insightful, allowing me to better appreciate how research translates into real-world patient care.

I am grateful to be part of this cohort and to have learned so much during my time abroad at Monash. I would also like to thank Alfred Health and the Emergency Research Unit for their invaluable guidance and support.

ABSTRACT

Background

Transient Ischaemic Attack (TIA) is a neurologic emergency associated with high short-term risk of recurrent stroke, particularly within the first 48 hours. Clinical guidelines emphasise the importance of timely assessment and initiation of secondary prevention strategies in the emergency department (ED). However, real-world adherence to these guidelines, especially regarding pharmacological management, is often inconsistent with adherence ranging from 30-42%.

Suspected TIA serves as a warning sign of impending stroke in patients, and therefore, management, especially pharmacological therapies to mitigate risk factors is essential for prevention of future strokes.

Method

A retrospective cohort study was conducted at a tertiary care hospital and included all adult patients (aged ≥ 18 years) presenting to the ED with a diagnosis of transient ischemic attack (TIA) over a specified study period. Data were obtained from electronic medical records, including patient demographics, clinical characteristics, ABCD2 scores, medical history, and details of pharmacological and non-pharmacological management. The primary outcome was adherence to current TIA management guidelines, including timely neuroimaging, initiation of secondary prevention medications, and appropriate referral for specialist assessment. Secondary outcomes included rates of recurrent stroke, hospital admission, and documentation of risk stratification. Analyses were performed by patient subgroups (e.g., by ABCD2 score, atrial fibrillation status, and age).

Results

A total of 137 patients with TIA were included in the analysis. The mean age was 67 (SD 15.8) years old, and 55% of patients were female. Patients were stratified into three groups: atrial fibrillation (AF), low-risk

ABCD2 (< 4), and high-risk ABCD2 (≥ 4). Age distribution differed significantly across groups, with a higher proportion of patients aged ≥ 60 years in the AF and high-risk ABCD2 groups ($p < 0.01$). Sex distribution was similar across groups ($p = 0.30$).

Medical history prior to ED admission revealed significant differences in the prevalence of hypertension, heart failure, and diabetes between groups (all $p < 0.05$). The AF group had the highest rates of hypertension and heart failure, while the high-risk ABCD2 group had the highest prevalence of diabetes. Pre-admission medication use also varied, with AF patients more likely to be prescribed antiplatelet, anticoagulant, statin, antihypertensive, and antiarrhythmic medications, while high-risk ABCD2 patients were more frequently on diabetes medication (all $p < 0.05$).

Guideline adherence for secondary prevention was suboptimal, with only 31% of patients receiving antiplatelet therapy in the ED at baseline. Neuroimaging rates were high, but timely initiation of secondary prevention medications and specialist referral remained inconsistent. There were no significant associations between clinician-related factors (e.g., physician seniority, stroke team consultation, pharmacist involvement) and guideline compliance.

Conclusions

This study highlights significant gaps in the management of TIA in the emergency department, particularly with respect to the timely initiation of secondary prevention medications and adherence to guideline recommendations. Despite the high risk of early recurrent stroke following TIA, real-world practice often falls short of evidence-based standards. The findings underscore the need for improved integration of risk stratification into clinical decision-making and for stronger institutional systems to promote consistent, guideline-concordant care. Addressing these gaps is essential to reduce the risk of recurrent stroke and improve outcomes for patients with TIA.

Viona Titania Riskikallail

Describing Policymaker Engagement in the Development of Clinical Practice Guidelines: An International Survey of Guideline Developers

Supervisor Names and Institute Affiliations:

Dr Samantha Chakraborty, Dr Tanya Millard, A/Prof Grace Wangge

Australian Living Evidence Collaboration

School of Public Health and Preventive Medicine, Monash University

Level 4, 553 St Kilda Road, Melbourne VIC 3004



Hi! I'm Viona, a fourth-year medical student from Universitas Indonesia. I recently completed my Honours year at Monash University, which was definitely a year I'll cherish for a lifetime. I chose my project on policymaker engagement in clinical practice guideline development as I have always been curious about how health systems work beyond the clinical setting. This project allowed me to explore how real-world decisions are informed by evidence and how guideline development is a very intricate process involving multiple stakeholders. Additionally, working alongside the amazing team at the Australian Living Evidence Collaboration gave me a unique peek into the behind-the-scenes of guideline development.

For me, Honours year is more than just a research year; it's also a journey of personal growth. Beyond building on critical thinking and research skills, I discovered new strengths and learned to push past my limits. This experience reaffirmed my dreams as a future doctor contributing to stronger health systems.

Honours can feel overwhelming and lonely at times, but it is an incredibly rewarding experience to explore your interests and get to know yourself. Do not hesitate to reach out! Everyone's always available to help.

I'm happy to answer any questions! Contact me at riskikallail@gmail.com.

ABSTRACT

Background

Clinical practice guidelines (CPGs) contain evidence-based recommendations designed to inform clinical decision-making and improve patient outcomes. Beyond clinicians, CPGs are increasingly influenced by stakeholders, including policymakers, due to their role in health policies. While policymakers are recognised as key stakeholders in CPG development, little is known about their current involvement. The CPG development guidance suggests guideline developers to engage stakeholders throughout all stages of CPG development, yet there is limited evidence regarding when, why and how policymakers have been engaged. The aim of this paper was to explore the ways in which policymakers have been engaged, the facilitators and barriers to their engagement and the perceived impacts of such engagement during CPG development.

Methods

An online survey was disseminated to guideline developers internationally who engaged or considered engaging with policymakers during CPG development. The survey was sent through direct (email invitations) and indirect (snowballing and social media platforms) approaches. The survey explored the activities of policymaker engagement and participants' experience surrounding policymaker engagement through open- and closed-ended questions. Quantitative data was analysed with simple descriptive statistical analysis, while qualitative data was analysed thematically.

Results

The study received a total of 44 responses. Most participants (70%) engaged with policymakers, mostly during CPG reviewing before publication and through meetings. Many participants engaged policymakers for multiple reasons, including policy alignment, informing policymakers, standard part of process, funding and dissemination. Three cross-cutting themes were identified to influence engagement: policymakers' impression of CPG importance, structural processes and relational-building strategies. Most participants reported experiencing moderate to very large impact from the engagement on CPG implementation. They shared the engagement facilitated CPG development and implementation by providing resources and funding, enhancing credibility and relevance and improving CPG usability.

Conclusion

Guideline developers engaged policymakers variably across stages of CPG development. Engagement was driven by strategic needs, such as funding, policy alignment and relevance. It was most effective when timely, built on shared priorities between guideline developers, policymakers and other stakeholders and sustained through trust. These findings highlight the need for future formal advice to support flexible and meaningful engagement with policymakers.

Amrita Saha

The association of socioeconomic status and survival from paediatric out-of-hospital cardiac arrest in Australia

Primary Supervisor: Professor Janet Bray

Co-supervisors: Dr Stuart Howell, Dr Ziad Nehme

Institute: School of Public Health and Preventative Medicine



I completed year 4C in 2024 and chose to undertake a BMedSc(Hons) this year at the School of Public Health and Preventative Medicine. I chose this topic because I've been interested in paediatrics and wanted to explore a pertinent public health issue that faces Australia's youth. Being my first exposure to research, this year has been an incredible learning experience and I am grateful for the skills I have gained. The honours year has its challenges which makes the experience that much more rewarding and I would highly recommend it to students who are considering it!

ABSTRACT

Background

Paediatric out-of-hospital cardiac arrest (pOHCA) is a rare but devastating event with high mortality. To improve survival, it is essential to understand the underlying epidemiology and the factors that influence it. Current knowledge of pOHCA epidemiology is limited, largely due to small sample sizes in prior studies. The impact of socioeconomic status (SES) on pOHCA characteristics and patient outcomes remains poorly understood, particularly in Australia. This study aims to describe the epidemiology of Australia's paediatric OHCA population in the context of SES and assess the association between SES and survival outcomes.

Methods

Data was obtained from the Australasian Resuscitation Outcomes Consortium OHCA Epidemiological Registry (Aus-ROC Epistry), which captures cases attended by emergency medical services (EMS) across Australia. All paediatric (< 18 years old) OHCA cases in Australia between 2017 and 2022 were included. SES was assessed using the Index of Relative Socioeconomic Disadvantage (IRSD) of the location of the OHCA. Crude incidence rates were calculated for the EMS-attended and EMS-resuscitated paediatric populations overall and by age group. Patient demographics, event characteristics and survival outcomes were described by SES Quartile, determined from the Index of Relative Socioeconomic Disadvantage (IRSD) score and categorised into four SES Quartiles, with Quartile 1 representing the most disadvantaged and Quartile 4 the least. Associations between SES, patient characteristics and survival outcomes (event survival and survival to 30 days/hospital discharge) were assessed using logistic regression models. Multivariable models adjusted for key patient and event

variables; interaction terms were tested and excluded if non-significant.

Results

Over the 5-year period, there were 3,070 pOHCA cases; 3,020 with a reported location of arrest were included. The overall crude incidence was 9.2/100,000 person years. There was variation between age groups: infantile rate = 53.7/100,000 person years, early childhood = 6.2/100,000 person years, late childhood = 3.1/100,000 person years and adolescent = 10.8/100,000 person years. Patient and event characteristics varied across the SES Quartiles. POHCAs in private residences, rural areas, unwitnessed status, non-shockable initial rhythm and medical aetiology were more common in lower SES Quartiles, whereas bystander CPR and defibrillation before EMS arrival were more frequent in higher SES Quartiles. Among non-EMS witnessed cases in whom EMS attempted resuscitation, the rate of event survival was 24.2% and survival to 30 days/discharge was 9.5%. In these pOHCA patients, rates of unadjusted survival varied between SES quartiles, but there was no association between SES Quartile and survival outcomes after adjustment for other known predictors of survival.

Conclusions

This study represents the first national analysis of pOHCA in Australia. The incidence rate of pOHCA in Australia is 9.2/100,000 and varied by age group. Differences in event characteristics and crude survival across SES quartiles suggest that SES influences outcomes through multiple mediating factors rather than acting independently. As SES was assigned based on arrest location, it may not reflect the individual's true SES. Targeted strategies are needed to reduce pOHCA incidence and improve survival.

Anjan Saini

Translating Sedation Research Into PratiCE: the TRACE pilot study

Supervisor Names and Institute Affiliations:

Professor Yahya Shehabi

- Director of Research | School of Clinical Sciences, Monash Health, Monash University
 - Consultant Intensivist | Department of Intensive Care, Monash Health
- Associate Professor Neil Glassford
- Consultant Intensivist | Department of Intensive Care, Monash Health

– Clinical Adjunct Associate Professor | School of Clinical Sciences, Monash Health, Monash University

– Adj Associate Professor (Research) | School of Public Health and Preventative Medicine, Monash University

Dr Adrian Pakavakis

- Consultant Intensivist | Department of Intensive Care, Monash Health
- Clinical Dean | School of Clinical Sciences — Monash University



My name is Anjan, I am a 2025 Honours student with an interest in critical care. I'm drawn to how it blends hands-on bedside care with complex physiology. I chose to undertake an Honours year to gain an understanding about the various aspects of research – from ethics, to method refinement, to data collection, to statistical analysis, and translation of evidence into clinical relevance.

My project investigated sedation practices in intensive care patients requiring invasive mechanical ventilation. This is a fundamental part of intensive care that has evolved considerably over time, yet the state of contemporary practice remains undefined.

If you are interested in undertaking an Honours year in this field, I am more than happy to be contacted at asai0013@student.monash.edu

ABSTRACT

Background

Sedation is integral to the care of invasively ventilated patients in intensive care. Excessive or prolonged sedation increases risk of prolonged ventilation, delirium and mortality. Over the past two decades, landmark trials and international guidelines have demonstrated optimal sedation requires light sedation depth, an analgesia-first approach, and use of short-acting agents. The COVID-19 pandemic disrupted adherence to guideline-based sedation practices worldwide. It remains unclear whether contemporary practice reflects evidence translation or sustained regression from pandemic-era change.

Method

In this retrospective, multicentre, before-and-after study across four Australian intensive care units, we compared sedation practices in invasively ventilated adults at two time points (2020-21 and 2023-24) with a historic Australian and New Zealand cohort from 2010. The primary outcome was early sedation depth, quantified using the Sedation Index during the first 48 hours of ventilation. Secondary outcomes assessed sedative and analgesic prescribing patterns, associations between early sedation depth and clinical outcomes, and predictors of early sedation depth.

Results

We collected data on 150 patients from each contemporary cohort and compared them with 251 from the historic cohort. Early sedation depth remained stable over time ($p=0.999$). Prescribing patterns shifted toward near-universal use of fentanyl for analgesia-first sedation (64.1% in 2010, 94.0% in 2020/21, 94.7% in 2023/24; $p<0.001$), and greater use of short-acting agents such as propofol (81.3%, 91.3%, 95.3%, respectively; $p<0.001$) and dexmedetomidine (23.1%, 23.3%, 42.0%, respectively; $p<0.001$) over time. Use of long-acting agent declined, including midazolam (67.7%, 48.0%, 39.3%, respectively; $p<0.001$) and morphine (51.4%, 4.0%, 7.3%, respectively; $p<0.001$). Early light sedation remained independently associated with lower

delirium incidence (odds ratio [OR] 1.31, 95% confidence interval [CI] 1.08-1.60, $p=0.007$; OR 1.52, 95%CI 1.11-2.10, $p=0.010$; OR 1.33, 95%CI 1.33-2.83, $p<0.001$; respectively) and greater likelihood of extubation (hazard ratio [HR] 0.77, 95%CI 0.70-0.86, $p<0.001$; HR 0.61, 95%CI 0.52-0.71, $p<0.001$; HR 0.53, 95%CI 0.43-0.64, $p<0.001$; respectively) when adjusted for illness severity, though not with hospital mortality. In the index cohort, active mobilisation (β -1.80, 95%CI -2.53 to -1.08, $p<0.001$) and pain (β -0.71, 95%CI -1.06 to -0.36, $p<0.001$) independently predicted the use of early light sedation; this relationship disappeared with time, suggesting greater standardisation of these care domains.

Despite a more acutely unwell population, reflected by over a 2.5-fold increase in emergency surgery admissions ($p<0.001$) and 1.2-fold increase in vasopressor use ($p<0.001$), modern cohorts demonstrated improved outcomes: more ventilator-free days at 28 days (median 22.1, 24.2, 24.9, respectively; $p<0.001$), shorter ICU stays (median 8.5, 5.8, 5.3 days, respectively; $p<0.001$) and lower delirium (50.7%, 12.9%, 19.5%, respectively; $p<0.001$) and hospital mortality (21.1%, 16.0%, 8.7%, respectively; $p=0.005$) rates.

Conclusions

Sedation practice within this Australian intensive care network has progressively aligned with international recommendations, with increased use of short-acting agents and an analgesia-first approach. Although early sedation depth remained unchanged, its consistent association with delirium and extubation timing reinforces its clinical importance. These exploratory analyses demonstrate that evolving sedation strategies and broader advances in intensive care have translated to measurable improvements in patient outcomes.

Alissa Septelia Saksen

Association between music, music-related activities and cardiovascular events in community dwelling older people

Supervisor Names and Institute Affiliations:

Dr Aung Zaw Zaw Phyo, MPH, MSc, PhD

Prof. Joanne Ryan, MBIostat, PhD

School of Public Health and Preventive Medicine



My Honors year at Monash was a true rollercoaster, an experience that challenged me at every turn but ultimately became one of the most fulfilling chapters of my academic life. The year was split between two fascinating research projects. The first semester had me diving into a systematic review, exploring the intricate relationship between music and physiological responses like blood pressure and heart rate. It was a rigorous and eye-opening introduction to the world of research.

In my second semester, I delved even deeper with my minor thesis, focusing on how music-related leisure activities might influence cardiovascular events in older people. This two-part journey taught me resilience, the value of perseverance, and how to navigate uncertainty, skills that will undoubtedly serve me for years to come.

Looking back, I already miss my time in Melbourne dearly. It's a city that opens so many doors to so many experiences, and the communities there are incredibly welcoming. To future students, I'd say embrace the challenge and the journey. Connect with your peers and supervisors, and make the most of every opportunity. It will be tough, but the feeling of accomplishment and the friendships you build are worth every bit of effort.

ABSTRACT

Background

This study investigated the associations between music-related leisure activities (listening to music or playing an instrument) and the risk of developing cardiovascular disease (CVD) events, as well as changes in blood pressure (BP) and heart rate (HR), in community-dwelling older Australians. Previous research has shown that music can influence cardiovascular function by modulating the autonomic nervous system and reducing stress, but the long-term effects on CVD outcomes were not well understood, especially in older adults.

Method

We analyzed longitudinal data from the ASPIrin in Reducing Events in the Elderly (ASPREE) study and its sub-study, the ASPREE Longitudinal Study of Older Persons (ALSOP). Our analysis included 10,591 participants who were free of major health conditions at the start of the study. We used Cox proportional-hazards regression models to assess the relationship between music-related leisure activities and incident CVD events. Linear mixed models were used to examine changes in systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) over time. We also explored whether these associations differed by age or gender.

Results

Over a median follow-up of 5.5 years, 780 incident CVD events were observed. After adjusting for sociodemographic factors,

often listening to music was associated with a 23% lower risk of incident CVD, and always listening was associated with an 18% lower risk. However, these associations were no longer statistically significant after further adjustment for lifestyle and clinical factors. There were no significant associations between playing a musical instrument and incident CVD events or its subtypes. Overall, we found no evidence of a link between music-related activities and changes in blood pressure or heart rate. However, a sex-specific analysis showed that always listening to music was associated with an increase in HR among women (adjusted beta = 0.13), and among people aged 74 years and older, often/always playing a musical instrument was associated with an increase in SBP (adjusted beta = 0.44) and DBP (adjusted beta = 0.17).

Conclusions

Our findings suggest that while frequent music listening may play a role in CVD prevention, its association appears to be largely explained by other health behaviors. These observational findings require validation through intervention studies to confirm their effectiveness. Music's accessibility and enjoyment make it a promising, non-pharmacological adjunct to promote psychological well-being, which may indirectly support cardiovascular health.

Jesselyn Jun Yi Sin

Sedation after Out-of-hospital Cardiac Arrest: A Post Hoc Descriptive and Comparative Analysis of patients from the Targeted Therapeutic Mild Hypercapnia after Resuscitated Cardiac Arrest (TAME) Trial

Supervisor Names and Institute Affiliations:

Professor Yahya Shehabi – Department of Intensive Care, School of Clinical Sciences, Monash Health

Associate Professor Neil Glassford – Department of Intensive Care, School of Clinical Sciences, Monash Health

Dr Adrian Pakavakis – Department of Intensive Care, School of Clinical Sciences, Monash Health



Hi! I'm Jess, an international student who completed Year 4 of medicine last year. I spent my Honours year with the Monash Health ICU research group, studying sedation practices after out-of-hospital cardiac arrest. I chose this project because it brought together my interests in critical care and data-driven research.

Working alongside ICU clinicians and researchers has been such an eye-opening experience. I learned how much teamwork, curiosity, and persistence go into producing meaningful clinical research. I also had the chance to join ICU ward rounds and contribute to multicentre studies, which gave me a real glimpse into life in critical care.

This year taught me how to manage large datasets in R, make sense of complex physiological data, and communicate research in a way that matters. More importantly, it taught me patience, problem-solving, and to celebrate small wins along the way.

To future students: The Honours year is one of growth - be curious, ask questions, and don't be afraid to make mistakes.

I'm happy to be contacted by future students interested in critical care research at jsin0054@student.monash.edu.

ABSTRACT

Background

Hypoxic-ischaemic brain injury is a major complication after out-of-hospital cardiac arrest (OHCA) but is potentially modifiable in the first 72 hours. In the intensive care unit (ICU), neuroprotective interventions often require sedation, typically for temperature control, ventilator synchrony and patient comfort. After 72 hours, neurological prognostication is usually performed. However, residual sedation can mask responsiveness, and prolonged sedation is associated with risks such as pneumonia and delirium.

Post-resuscitation guidelines recommend using light sedation, avoiding prolonged sedation and weaning when safe. However, the guidelines do not specify sedation depth, duration or preferred agents. This leaves sedation choice to clinician preference, patient risk profiles and local protocols. This has led to wide variation in sedative choice across jurisdictions. Despite the central role of sedation in post-resuscitation care, the optimal approach to sedation is largely unknown in post-OHCA care.

Aims

This study aimed to describe the use of sedative and analgesic agents in early post-OHCA care and evaluate the associations of these sedatives with favourable 180-day functional recovery, 30-day mortality and extubation timing.

Methods

This was a post hoc analysis of the Targeted Therapeutic Mild Hypercapnia after Resuscitated Cardiac Arrest (TAME) trial, which randomised 1686 OHCA patients to targeted hypercapnia or normocapnia. Deep sedation (Richmond Agitation-Sedation Scale of -4) was mandated during the 24-hour intervention period. The analytic cohort consisted of patients who were alive in the ICU at 72 hours. Cumulative doses of sedative and analgesic agents used were recorded in the first 72 hours post-randomisation.

The primary outcome was a favourable 180-day functional recovery, measured as a binary variable with the Glasgow

Outcome Scale-Extended score. This was analysed using multivariable logistic regression. Cox proportional hazards regression models assessed associations between sedatives and 30-day all-cause mortality and time to final extubation. These outcomes were adjusted for baseline illness severity and other clinical factors.

Results

Fibrin-amyloid particles were seen in both placentas of women with COVID-19 in pregnancy and without COVID-19 in pregnancy using the Congo Red and AmyTracker 680 staining methods. This demonstrates that these particles may be found in pregnancy, regardless of COVID-19. There was a non-significant upwards trend in the levels of particles in the control group compared to the COVID-group in the Congo Red-stained whole lobe samples.

Whereas, within the Congo Red four lobe sections and the AmyTracker 680 groups, when compared with the control group, the COVID group displayed a non-significant incline in particle levels. The overall levels of particles in the AmyTracker 680 stained sections are drastically less compared to the levels seen in the sections stained with Congo Red.

Conclusion

In this post hoc analysis, dexmedetomidine use was associated with improved survival and functional recovery, whereas propofol and midazolam were not. By evaluating associations between sedative use and patient-centred clinical outcomes, this study represents a preliminary effort to address a deficiency in post-resuscitation care research.

This study benchmarked real-world sedation practice and demonstrated potential signals of benefit with dexmedetomidine use. Nonetheless, these are hypothesis-generating findings, supporting the need for dedicated interventional trials to determine the safety, feasibility and benefits of dexmedetomidine in the post-OHCA population.

Jayden Luis Soares

Examining the Bcl-2 Pro-Survival Pathway in IgE Plasmablasts in vitro

Supervisor Names and Institute Affiliations:

Prof. David Tarlinton and Dr Marcus Robinson. Department of Immunology



I wanted to work on a research project that asked a deeply scientific question behind biological mechanisms in allergy that could provide foundation for clinical questions. This allowed me to expand my skill set in the lab and improve my critical thinking when interpreting results and evaluating issues as they arose. My year was full of many set backs at various times that were quite disheartening, so my advice is to maintain a positive outlook and be confident in your ability to deal with your challenges.

ABSTRACT

Background

The disease burden of allergy continues to rise in the developed world and regardless of the numerous treatments, the diversity of allergy means further understanding of the mechanisms could prove useful. The memory of the allergic response in vivo is partially held in IgE long lived plasma cells that could have differing internal survival mechanisms than other isotypes in relation to the Bcl-2 family proteins. The Bcl-2 family proteins sit within a balance in all cells that regulate the mitochondrial pathway of apoptosis. We attempted to examine the Bcl-2 survival proteins that exist within cells as a means of finding a new way to treat allergies.

Aim

To develop IgE plasmablasts in vitro and test their dependency on specific Bcl-2 family proteins in contrast to other isotypes as a means of further understanding the biology of allergy.

Method

B cells were seeded and incubated before being exposed to venetoclax, A1331852 and S63845 which inhibits Bcl-2, Bcl-xL and Mcl-1 respectively. These cells were then analysed through flow cytometry to reveal impact across isotypes and B cell types.

Results

Staining of some of the Bcl-2 family proteins revealed mild differences in expression across mature PC (CD27+/CD38+) and B cells (CD27-/CD38-). However, differences of reliance on Bcl-2 proteins in newly cultured B cells that were cultured with inhibitors did not reveal meaningful differences across immunoglobulin isotype.

Conclusions

While the study did not identify isotype-specific mechanisms underlying changes in B cell reliance on Bcl-2 family proteins, it provides a valuable foundation for future investigations into the survival pathways of distinct B cell subsets. Further research needs to be done in this area to prove that there is no explicit characteristics of B cells that is associated with differential reliance on Bcl-2 pro-survival proteins.

Shayan Soroush

Predictors and health outcomes of delayed union and nonunion following femoral and tibial shaft fractures

Supervisor Names and Institute Affiliations:

Supervisors:

- Prof Belinda Gabbe a
- Prof Richard de Steiger b,c
- A/Prof Susan Liew d,f
- A/Prof Raphael Hau a,e,g
- Dr Andrew Oppy h
- Dr Wei-Han Tay g,h

Institutions and Departments:

- Monash University – School of Public Health & Preventive Medicine
- The University of Melbourne – Department of Surgery
- Epworth Healthcare – Department of Surgery
- Monash University – Department of Surgery

- Monash University – Eastern Health Clinical School
- The Alfred Hospital – Department of Orthopaedics
- Box Hill Hospital - Department of Orthopaedics
- Royal Melbourne Hospital – Department of Orthopaedics



I chose to undertake my Honours project within orthopaedic trauma surgery to give me more exposure to the clinical and academic sides of the profession. The project was motivated by a previous Alfred and RMH study led by two of my supervisors, which reported quite high rates of impaired healing in femoral and tibial shaft fractures. I was curious to see whether this had changed over time, and what factors were most strongly associated with delayed union or nonunion. Designing the project gave me the chance to shape the scope of these factors I would investigate through my literature review.

Throughout the year, I learnt a great deal about statistical methods and data analysis, from applying different modelling approaches to linking datasets and exploring the basics of coding. I also strengthened my presentation and communication skills through sharing my work in academic and clinical settings. These academic experiences, alongside lots of time spent in theatre, offered great learning and exposure. I would highly recommend registry-based projects to future students, and am happy to be contacted for advice on socials or shayanraya@gmail.com.

ABSTRACT

Background

Femoral and tibial shaft fractures are associated with high rates of delayed union and nonunion. The aims of this study were to identify predictors of delayed union and nonunion following these injuries, and to compare health outcomes between patients with timely union and patients with impaired healing to aid prognostication of outcomes and improve understanding of these fracture complications.

Methods

This was a registry-based cohort study using the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) data, supplemented with medical record review at the Alfred and Box Hill Hospitals. Patients ≥ 16 admitted with femoral or tibial shaft fractures between 1st July 2018 and 30th June 2023 were included. Delayed union and nonunion were determined using time-based parameters, reoperation for impaired healing and the modified Radiographic Union Score for Tibial Fractures (mRUST). Multivariable logistic regression was used to identify predictors of impaired healing, and mixed-effects models assessed the impact of healing outcomes on EQ-5D utility scores, WHODAS percentage and return to work at 6, 12 and 24 months.

Conclusions

Delayed union and nonunion remain prevalent complications following femoral and tibial shaft fractures, affecting one in four fractures. Several patient, injury and treatment factors associated with impaired fracture healing were identified. Additionally, patients with impaired healing experienced worse HRQoL and vocational outcomes. These findings improve understanding of factors underlying impaired healing and the health outcomes following these complications, which can inform future strategies to reduce the burden of impaired healing.

Jack Stewart

Effects of Statin Treatment on Coronary Plaque Morphology: Longitudinal, Radiomics-Based Precision Phenotyping Using Computed Tomography Coronary Angiography

Supervisor Names and Institute Affiliations:

A/Prof Andrew Lin and A/Prof Nitesh Nerlekar

Victorian Heart Institute



My name is Jack, and I completed my BMedSc(Hons) at the Victorian Heart Institute, which operates out of the Victorian Heart Hospital.

While I was at first unsure about whether to commit a year of my time to complete an honours degree, I can now safely say that this was both a rewarding and productive experience. Having never performed any research prior to this year, I feel far more adept at establishing and conducting well-designed research protocols, as well as appraising scientific literature. These are skills that I will continue to develop moving forwards.

Cardiovascular research is certainly an exciting area of medicine, and I would wholeheartedly recommend the Victorian Heart Institute to any prospective BMedSc(Hons) students.

ABSTRACT

Background

Computed tomography coronary angiography (CTCA) is an established, first-line test for the evaluation of patients with suspected coronary artery disease (CAD). While current clinical reporting of CTCA relies on qualitative visual assessment, quantitative plaque analysis offers a more robust, objective method of determining CAD burden and morphology. Radiomics is the process of extracting thousands of quantitative features from medical images to generate big data and identify new imaging biomarkers. Statins are the cornerstone of treatment of CAD, yet many patients on statin therapy still develop acute coronary syndrome. There is a clinical need for more precise and personalised measures to monitor response to lipid-lowering therapy. Radiomics-based analysis using CTCA provides an opportunity to more deeply phenotype morphological plaque changes in response to statin treatment. Our study aims to examine the effects of statin treatment on coronary plaque morphology using radiomic phenotyping in patients with stable CAD undergoing CTCA.

Methods

This was a retrospective observational study of adult patients who underwent clinically indicated serial CTCA at Monash Health, with at least a two-year interval between baseline and follow-up scans. Quantitative plaque analysis was performed for the whole coronary tree using automated research software (Autoplaque). Plaque segmentations were exported to Radiomics Image Analysis software, where 1,103 radiomic features were calculated for each lesion. Linear mixed models were used to examine the association between statin treatment and lesion-level changes in radiomic features, with adjustment for cardiovascular risk factors and baseline plaque volumes. Logistic regression models were used to assess the incremental value of radiomic features for predicting response to statin treatment (defined as annualised plaque burden progression below the median of the cohort).

Results

The final study population comprised 375 patients, of whom 139 (37.1%) were statin-naive and 236 (62.9%) were statin-treated. A total of 1,069 coronary lesions were analysed at both baseline and follow-up: 355 in statin-naive patients and 714 in statin-treated patients. Among the 1,103 radiomic features, 68 (6.2%) were independently associated with statin treatment, including: 6 first-order features, 22 textural features, and 40 geometric features. Radiomic features provided incremental value for predicting statin response when added to a logistic regression model containing qualitative plaque type and quantitative plaque burden (area under the receiver operating characteristic curve 0.71 [0.68-0.74] vs 0.63 [0.60-0.67], $p=0.01$).

Conclusion

Statin treatment is associated with changes in radiomic features of coronary plaques on CTCA, independently of cardiovascular risk factors and plaque volumes. Radiomic phenotyping may help identify novel imaging biomarkers of patient response to statin therapy.

Darren Tan

AI-powered Prediction of Pre-eclampsia through Retinal Imaging

Supervisor Names and Institute Affiliations:

A/Prof Andrew Symons Dr Brian D. Earp: University of Oxford

- Centre for Eye Research Australia, Royal Victorian Eye and Ear Hospital
- Department of Optometry and Vision Sciences, University of Melbourne
- Ophthalmology, Department of Surgery, University of Melbourne
- Department of Surgery, School of Translational Medicine, Monash University

Prof Lyndell Lim

- Centre for Eye Research Australia, Royal Victorian Eye and Ear Hospital
- Ophthalmology, Department of Surgery, University of Melbourne
- Royal Victorian Eye and Ear Hospital



Hello! My name is Darren and I completed my BMedSc(Hons) project with the School of Translational Medicine after my fourth year of medical school. As I was interested in ophthalmology, I chose a project and research group affiliated with the Centre for Eye Research Australia.

This was a difficult and enriching year for me. Far removed from the routine of previous years, the style of assessments and day-to-day was completely new. In research you are the main driver for your project, and I learnt to take responsibility and critically evaluate my own research. I also gained more experience working in a team, as I organised meetings with busy researchers, worked on ethics and governance amendments with other students, and reviewed multiple iterations of my assignments with my supervisors before the deadline.

The feedback and learning curve in research can be jarring but also a catalyst for growth. I am very grateful to my research team and the BMedSc(Hons) year for giving me insight into a different yet integral part of medicine, and allowing me to explore my interest in ophthalmology clinically and through research.

I am very happy to be contacted through email or messages if you have further questions!

dtan0054@student.monash.edu

ABSTRACT

Background

Pre-eclampsia affects 2-8% of pregnancies worldwide and is a significant cause of poor maternal and foetal outcomes. Current pre-eclampsia screening either has low sensitivity or requires invasive tests. Oculomics is an emerging field which uses retinal images to predict systemic diseases such as pre-eclampsia. This is done through a fundus camera, which is non-invasive and safe in pregnancy. As pregnant women with pre-existing diabetes already require eye screening in the first trimester, such a prediction tool can be smoothly integrated into their routine examination. Identified women can then receive aspirin, have increased monitoring and be transferred to appropriate obstetric centres.

Method

We conducted a post-hoc analysis of a 2017 study by Widyaputri and colleagues, where they collected retinal images from 146 pregnant women with pre-existing diabetes. We included 83 women as they had given extended consent, had a gradable retinal image <20 weeks and had pre-eclampsia outcome documented. The earliest image in each instance was inputted into a deep learning model, which extracted 35 retinal measurements looking at the width and tortuosity of the vessels as well as lesions such as soft/hard exudates. We completed univariate logistic regression (pre-selecting features with $p < 0.05$) and LASSO regression between each feature and pre-eclampsia outcome. Finally, we constructed seven prediction models which were a combination of retinal features and clinical risk factors such as chronic hypertension and autoimmune disease, and assessed their performance by calculating the area under the curve (AUC).

Results

Univariate logistic regression selected Tortuosity Density of Venule (OR=2.13, $p < 0.05$) and Curvature Tortuosity of Arteriole (OR=0.40, $p < 0.05$), and LASSO regression selected Tortuosity Density of Venule. The model which included only retinal features had an AUC of 0.713, outperforming clinical risk factors (age, parity, chronic hypertension, renal disease, autoimmune disease and previous pre-eclampsia) which had an AUC of 0.694. The best performing models were a combination of retinal features and clinical risk factors, with AUCs of 0.78 and 0.805 respectively.

Conclusions

A combination of retinal features and clinical risk factors outperforms traditional risk factor screening alone. This suggests that there are changes in the retina which occur in the first 20 weeks which indicate a higher likelihood of pre-eclampsia later on in pregnancy. This prediction tool can be smoothly integrated into existing first trimester screening, so that identified women can receive the necessary care, and especially in low-resource settings, be moved to appropriate care centres. As Oculomics and fundus cameras continue to develop, it is exciting to see the potential of screening for a variety of diseases through a single retinal image.

Nick Tellus

Immune Biomarkers in the Prediction of Preterm Brain Injury

Supervisor Names and Institute Affiliations:

Professor Marcel Nold 1, 2, 3

Associate Professor Sam Forster 4, 5

Josephine Owen 1, 2

1. Department of Paediatrics, Monash University, Melbourne 3168, Australia.

2. Ritchie Centre, Hudson Institute of Medical Research, Melbourne 3168, Australia.

3. Monash Newborn, Monash Children's Hospital, Melbourne 3168, Australia.

4. Centre for Innate Immunity and Infectious Disease, Hudson Institute of Medical Research, Melbourne 3168, Australia.

5. Department of Molecular and Translational Science, Monash University, Melbourne 3168, Australia.

ABSTRACT

Background

Preterm babies, or those born before 37 weeks of gestation, are particularly susceptible to pathologies that can affect many organ systems, including the brain. Within the brain of these neonates, intraventricular haemorrhage (IVH) describes a haemorrhage originating from the vascular-rich germinal matrix and is one of several pathologies that have been implicated in long term neurodevelopmental sequelae. Central to IVH is a local and systemic inflammatory response intended to clear the extravasated blood products, but which can also directly damage brain parenchyma.

On a background of marked heterogeneity, current research in human preterm neonates has not yet determined the inflammatory pathways that may be involved in post-IVH inflammation.

This study aims to characterise the longitudinal changes in the immune profiles of preterm babies afflicted by IVH, and to determine the neurodevelopmental outcomes following IVH.

Method:

As an ancillary study from the 'Gut, Lung and their Microbiomes and Immunology' (GLAM&I) and Anakinra Pilot studies, neonatal patients were recruited across a range of gestational ages at Monash Children's Hospital, Australia and Starship Children's Hospital, New Zealand. Peripheral blood samples were collected at several timepoints across the patient's admission to the neonatal intensive care unit. Samples underwent spectral flow cytometry for high-fidelity immunophenotyping and cell function analysis. Additionally, serial cranial ultrasounds were used to diagnose and grade the severity of IVH. Three neurodevelopmental assessments were conducted: the Generalised Movement Optimality Score, the Hammersmith Neonatal Neurological Exam and the Hammersmith Infant Neurological Exam.

Results

In a cohort of 58 preterm neonates, 33 (57%) were diagnosed with IVH, predominantly of grade 1 (16; 28%) or grade 2 (15; 26%) severity. Patients with IVH were born at a lower gestational age, compared to non-IVH patients. IVH diagnosis and severity were associated with acute and longitudinal increases in neutrophil proportions among leukocytes. Furthermore, IVH was associated with higher proportions of neutrophils that produced interferon-gamma (IFN γ). Dendritic cells demonstrated some polarisation towards the conventional dendritic cell type 1 (cDC1) phenotype in patients with IVH, and production of tumour necrosis factor (TNF) by dendritic cells was also linked to IVH grade and worsening haemorrhage severity.

Within the small cohort, IVH presence and severity was not associated with worsening neurodevelopmental outcomes, as measured by each of the three assessments.

However, higher neutrophil proportions among leukocytes were correlated with worsening neurodevelopmental scores, suggesting a damaging role of neutrophils in the brain. Contrastingly, IFN γ + neutrophil proportions at day 1 were moderately correlated with improved neurodevelopmental outcomes.

Conclusions

These results provide foundational evidence of the possible immune mechanisms that may underpin post-IVH inflammation. Neutrophil and dendritic cell production of IFN and TNF respectively demonstrated some of the most salient differences between IVH and non-IVH patients. With further recruitment, we hope that these data can be strengthened to form more robust conclusions and lead to trials of anti-inflammatory therapeutic agents in animals and humans, to improve outcomes for preterm neonates with IVH.



Hi, I'm Nick! Research has always been on my radar and a BMedSc(Hons) presented the perfect opportunity for me to get involved in this area. When deciding which project to join, I knew that I was passionate about paediatrics, but I wasn't set on a specific sub-specialty. However, I knew that I wanted to learn as many research skills as possible, and this was a key reason why I chose my project - I was able to learn skills in patient recruitment, sample processing in the lab, data analysis and (obviously) scientific writing.

This year has been so different to any other year of med school. There is a heavy emphasis on self-organisation in an Honours year, so I had to make sure that I was on top of my own deadlines whilst managing the lab work for the ongoing trial. It has been a lot to juggle, but I've been supported by a wonderful team of supervisors who have instilled in me a passion for research!

Feel free to reach out if you've got any questions about Honours projects!

Hashini Thilakaratne

Understanding the biological pathways which underpin SKY92-defined high risk Multiple Myeloma

Supervisor Names and Institute Affiliations:

Professor Andrew Spencer 1, Dr Nicholas Bingham 1.

1. Australian Centre for Blood Diseases, School of Translational Medicine - Monash University.



Hey I'm Hashini! I completed my BMedSc(Hons) with the Myeloma Department at the Australian Centre for Blood Diseases. I chose to do an honours year because I thought it would be a good opportunity to build my research skills, learn about non-clinical aspects of medicine and further my knowledge in a field I've had very limited exposure to. My research focusses on Multiple Myeloma, specifically prognostic tools in this blood cancer. I've found this year incredibly rewarding.

I've had the opportunity to develop an array of research skills including learning how to perform a literature view and conduct independent data analysis. Thanks to my supervisors, I've also been able to present a poster at the STM Graduate Research Student Symposium and attend several seminars of leading researchers in the haematology field. I'm very grateful to have received so much kindness and support from my supervisors and the myeloma team this year. I would highly recommend anyone thinking about doing an honours year to give it a go! It's such a great experience to learn new skills and meet some incredible people outside of clinical medicine! Feel free to contact me on FB or at hashini2003@gmail.com if you have any questions

ABSTRACT

Background

Multiple Myeloma (MM) is a haematological malignancy with globally improving survival rates. Despite this, numerous newly diagnosed MM (NDMM) patients exhibit dismal prognosis. In practice, prognostic scores incorporating (HRCA) are used to identify NDMM patients at risk of poor prognosis. In clinical trials, gene expression profiling (GEP) signatures have improved risk assessment of these patients. Conventional prognostic scores often mischaracterise two cohorts of patients. These include Functional High Risk (FHR) patients who are defined by early disease progression within 18 months despite treatment, and a subset of patients who are high-risk on GEP. SKY92 is a commercially available GEP signature which may provide better risk prediction. Patients with SKY92 high-risk (SKY92 HR) exhibit median survival rates under two years. Notably, several SKY92 HR patients do not exhibit traditional HRCA, indicating a subset of risk 'Discordant' patients. The gene expression patterns of these Discordant patients and FHR patients have been underexplored. This study explores the clinical outcomes and gene expression patterns of these understudied populations in a real-world setting.

Method

59 patients were included. The FHR subgroup included 48 patients with evaluable survival data. There were 13 patients who met criteria for FHR. FHR patients exhibited significantly poorer survival outcomes ($p=0.018$). Conventional prognostic scores and SKY92 classification demonstrated poor predictive utility for FHR.

FHR patients had 7 DEG by SKY92 signature and 16 DEG by whole transcriptome ($p<0.01$, $\text{LogFC}>1$). These showed enriched DNA replication, chromosome segregation and cell-cycle functions. On whole transcriptome pathway analysis, FHR patients exhibited upregulated proliferative pathways. We constructed a 6-gene signature ($p = 1.44e-04$, $\text{AUC} = 0.912$) to predict FHR.

There were 42 patients with cytogenetics and SKY92 data, 17 of which were Discordant. By SKY92, Discordant patients closely resembled patients with both SKY92 HR and HRCA, with one unique DEG ($p<0.01$, $\text{LogFC}>1$) between groups. On whole transcriptome pathway analysis, Discordant patients showed upregulated MYC targets and metabolic pathways.

Conclusions

This study identified unique gene expression patterns within two cohorts commonly mischaracterised by conventional prognostic scores. FHR patients had a highly proliferative signature, to be validated in an external cohort. Discordant patients exhibited shared gene expression patterns, related to MYC signalling. These insights into the tumour biology of these patients may inform further exploration into novel prognostic and predictive markers in NDMM and guide exploration of risk-adapted therapies in these vulnerable populations.

Shogo Trevena

Development and Validation of Prediction Models for Acute Kidney Injury Following Lung Transplantation

Supervisor Names and Institute Affiliations:

Supervisor:

A/Prof Tim Coulson

Co-Supervisor:

A/Prof Mark Shulman

Department of Anaesthesiology and Perioperative Medicine, The Alfred Hospital, Melbourne, Australia

Department of Anaesthesiology and Perioperative Medicine, Monash University, Melbourne, Australia

School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia



My name is Sho and I completed my BMedSc(Hons) after wanting a change from clinical medicine following a busy year 4C. The academic process of conducting research demanded critical thinking and specific skills beyond what I had needed to call on so far in my medical training. While challenging, the overall process was satisfying and rewarding, and I can say that I would not have developed many of these skills otherwise.

The year also provided me with an extended and unique exposure to anaesthesia, reinforcing my interest in the specialty as a potential future career path.

Beyond research and clinical experience, the honours year provided me with an opportunity to re-engage with sports and interests that had been sidelined during fourth year.

If you are interested to know more about what my experience was like, or what to expect from the year, feel free to email me at shogotrevena1@gmail.com.

ABSTRACT

Background

Acute kidney injury (AKI) is a common complication following lung transplant (LTx), associated with increased morbidity, mortality, and healthcare resource burden. Existing risk models have not investigated risk factors across the entire perioperative course, and few have explored intraoperative or early postoperative contributors such as vasopressor use, which remains poorly understood in this population.

Aim

This study aimed to develop and internally validate multivariable prediction models at distinct perioperative stages to identify key risk factors for any-stage AKI and the requirement for renal replacement therapy (RRT) postoperatively in an Australian LTx population.

Method

A retrospective cohort study of adult LTx patients at The Alfred Hospital between January 2016 and April 2025 was conducted. Data were obtained from electronic medical records, and a complete-case analysis was performed. AKI was defined using the KDIGO serum creatinine criteria within seven days postoperatively. RRT requirement was defined as need for haemofiltration/dialysis at any stage postoperatively within the same hospital admission.

Three prediction models at sequential time points were developed for both outcomes of any-stage AKI and the requirement for RRT: immediately preoperatively, immediately postoperatively, and at four hours postoperatively. A two-stage modelling approach was utilised: first, least absolute shrinkage and selection operator (LASSO) regression with 500 bootstrap resamples identified the most stable predictors, followed by logistic regression modelling using the chosen predictors. Internal validation via bootstrapping was used to obtain optimism-adjusted performance estimates of calibration and discrimination.

Results

The study included 534 patients, with 216 (40.4%) patients developing AKI and 47 (8.8%) patients requiring RRT postoperatively. Across the three perioperative stages, validated area under the receiver operator curves (AUCs) for AKI prediction ranged from 0.632 to 0.741, using five to nine stable predictors. For RRT requirement, validated AUCs ranged from 0.716 to 0.839, and contained three to five predictors. Sequential modelling identified key predictors of renal injury that evolved perioperatively, with variable importance changing as new data points were introduced. Novel predictors for AKI identified included a primary indication of chronic lung allograft dysfunction (odds ratio [OR] 5.955, 95% confidence interval [CI] 1.668 – 21.263, $p = 0.006$), lower PaO₂/FIO₂ ratio within four hours postoperatively (0.996 [0.994-0.999], $p = 0.002$) and higher cumulative noradrenaline dosage within four hours postoperatively (OR 1.014 [1.001-1.028], $p = 0.037$).

Conclusions

This study provides a comprehensive assessment of risk factors implicated in renal injury in LTx patients, through the development and validation of robust prediction models at three critical perioperative timepoints. The rigorous methodology, combining LASSO variable selection with stability analysis and bootstrap validation of the final logistic regression models, yields findings that are both generalisable and internally valid. The models developed demonstrate that AKI and the requirement for RRT postoperatively can be predicted with reasonable discrimination using a parsimonious set of variables. Postoperative cumulative noradrenaline dose was predictive of AKI, whereas intraoperative vasopressor use was not. The findings of this study offer a foundational, hypothesis-generating platform that can guide future validation, mechanistic studies and targeted interventional research in the prevention of AKI after LTx.

Ida Ayu Kyara Ferbena Trininta

Evaluating VCP979 as a Novel Anti-Inflammatory and Anti-Fibrotic Compound for Reversal Therapy of Cardiac Remodeling in Mice with Established HFpEF

Supervisor Names and Institute Affiliations:

A/Prof. Bing H. Wang,¹ Dr. Ruth Magaye,¹ and Professor David Kaye ²

1. Heart Failure Research Group, Baker Heart and Diabetes Institute, Melbourne, VIC

2. Department of Cardiology, Alfred Hospital, Melbourne, VIC



Hi, my name is Kyara! I'm a fourth year medical student from the University of Indonesia and I chose to do my BMedSc(Hons) at the Baker Heart and Diabetes Institute to gain hands-on experience in cardiovascular research.

Throughout this year, I've developed invaluable skills in critical thinking, data analysis, and scientific communication, as well as a deeper appreciation for the complexities of translational cardiovascular research. My project has given me insight into the intricate links between metabolic dysfunction, inflammation, and cardiac remodelling, an area I hope to continue exploring in the future.

I am incredibly grateful for the mentorship and encouragement from my supervisors and lab team, who have guided me through every step of this research journey. Completing my Honours has been one of the most rewarding experiences of my degree, and I would wholeheartedly recommend it to anyone interested in bridging the gap between clinical medicine and scientific discovery.

I am more than happy to be contacted by any future students at:
ktri0013@student.monash.edu

ABSTRACT

Background

HFpEF is a multifactorial clinical syndrome responsible for 15% of annual mortality rate worldwide. Current therapies, including SGLT2 inhibitors, provide only symptomatic relief without modifying disease progression or mortality. This underscores the urgent need for preclinical models replicating the multifactorial nature of HFpEF and interventions targeting its underlying mechanisms.

Method

A multi-hit HFpEF mouse model was developed using 10-month-old female C57BL/6J mice, fed a high-fat diet (HFD) for five months and administered a single intraperitoneal dose of deoxycorticosterone pivalate (DOCP) at week 12. This design integrates aging, female sex, obesity, prediabetes, and mineralocorticoid-induced hypertension, closely reflecting human HFpEF. Statistical analyses were conducted using GraphPad Prism 10.4.1, with data expressed as mean \pm SEM. Student's unpaired t-test or two-way ANOVA was used for comparisons, and analyses were performed blind.

Results

The combination of VCP979 and dietary reversal yielded the most significant improvements in reducing visceral adiposity, hepatic inflammation, and fibrosis markers (TGF- β , α -SMA), aligning with improved metabolic health and fibrosis resolution.

VCP979 or diet reversal alone did not result in many significant improvements. Despite the model's limitations in inducing sustained hypertension, it provided valuable insights into the metabolic and inflammatory drivers of HFpEF. Additionally, the disconnect between improved metabolic homeostasis and unchanged exercise capacity suggests peripheral inefficiencies that warrant further exploration. Overall, these findings support a dual-target approach addressing both inflammatory and metabolic pathways in HFpEF.

Conclusions

This study developed a clinically relevant multi-hit HFpEF model in aged female mice, integrating key human risk factors. The combination of VCP979 and dietary reversal demonstrated superior efficacy in reducing systemic inflammation, visceral adiposity, and hepatic fibrosis. These findings highlight the therapeutic potential of targeting both metabolic and inflammatory pathways in HFpEF. Future studies should refine this model to better replicate human hemodynamics and elucidate the mechanistic underpinnings of combined metabolic and p38 α -MAPK-targeted therapies.

Nishkala Vishu

Unravelling the Haze: Characterising Subjective and Objective Cognitive Decline in Menopause

Supervisor Names and Institute Affiliations:

A/Prof Caroline Gurvich and Dr Elizabeth Thomas. HER Centre Australia



I completed my honours year with HER Centre/STM. I chose this project because it blends neuropsychology and women's health, which are areas I am passionate about. This year has been transformative, and I've learned many skills ranging from designing recruitment posters to conducting participant interviews. Beyond research, this year has made me become more independent and appreciative of the work that goes into innovation in medicine.

For future honours students: The year goes quickly, so make sure you write consistently. Be patient with your progress; research isn't instant. I am happy to be contacted by future honours students on nvis0004@student.monash.edu.

ABSTRACT

Background

“Brain fog” is a common cognitive presentation in menopause. Research exploring cognition in menopause is limited, particularly for surgical menopause. Surgical menopause refers to the removal of both ovaries and fallopian tubes, and most commonly occurs due to cancer-predisposing breast cancer gene (BRCA) 1/2 mutations. These women undergo sudden, premature menopause, which may increase subjective cognitive issues and quality of life burden.

Aim

Our study aimed to 1) compare the subjective and objective cognitive profiles in pre- and surgically menopausal BRCA 1/2 women, 2) compare the subjective and objective cognitive profiles between surgically and naturally menopausal women, and finally, 3) determine if subjective cognition has more associations with objective cognition or psychosocial measures across subtypes.

Method

Participants were recruited from two parent studies (EM-COG and MENO-COG) and divided into three groups (pre-menopause (n=23), surgical menopause (n=20) and natural menopause (n=15)) based on menopause status. They then underwent the following neuropsychological assessments: Rey Auditory Verbal Learning, Brief-Visuospatial Memory-Revised, Stroop, Digit Symbol Coding, Digit Span and Controlled Word Association tests. Participants also completed various self-report mood and menopause symptom questionnaires. Non-parametric analyses were conducted utilising Mann-Whitney U to compare groups' subjective and objective scores, and Spearman correlations were used for associations. Correlation matrices were converted to heatmaps to compare associations between menopausal subtypes.

Results

Surgical menopause was associated with increased subjective cognitive symptoms when compared to the same-aged BRCA 1/2 group of pre-menopausal women, despite no group differences in objective cognition. Naturally menopausal women had poorer subjective cognition, visual memory and processing speed than those in surgical menopause. Correlations varied across menopausal subtypes; in surgical menopause, subjective cognition had significant associations with depression, anxiety, insomnia, stress and sexual dysfunction. In natural menopause, there was a pattern of associations between subjective and objective cognition, particularly executive function and phonemic fluency.

Conclusions

Novel findings from our study suggest that both surgical and natural menopause are associated with cognitive symptoms that differ in their nature and severity. Surgical menopause may result in more subjective cognitive impairment than in women of the same age, with complaints linked mainly with psychosocial burden. In natural menopause, subjective and objective cognitive deficits appeared more severe than those in surgical menopause, although this may be influenced by methodology. Subjective cognition in natural menopause had more trend-level associations with objective cognition. These results highlight that cognitive symptoms are common across both surgical and natural menopause. Future research should explore interventions targeting psychosocial well-being during this reproductive phase. Broadly, our results contribute to the emerging idea that “brain fog” is a complex presentation that may represent underlying cognitive and psychosocial issues.

Chen Wang

The Use of AI in Predicting Primary Open-Angle Glaucoma Progression Using OCT Data

Supervisor Names and Institute Affiliations:

A/Prof Marc Sarossy 1,2, A/Prof Christine Chen, 1 Professor Alex Hewitt 2,3

1. Monash University, Faculty of Medicine, Nursing and Health Sciences, Clayton, Melbourne, Victoria, Australia
2. Centre for Eye Research Australia, University of Melbourne, Melbourne, Victoria, Australia.
3. Menzies Institute for Medical Research, University of Tasmania, Hobart, Tasmania, Australia



Hi everyone, hope you are doing well! My name is Chen. I decided to do an Honours year after completing my fourth year because I wanted to experience what research was really like and to challenge myself to learn something new. I was also curious about artificial intelligence - it's such a big topic in today's world, but I didn't know much about how it works or the ways it could be applied in healthcare.

At the start, it was definitely quite challenging. I had very little background in AI or programming, so there was a steep learning curve. But as the year went on, I gained a much better understanding and appreciation for both the technical and research sides of the project. I've learned how to problem-solve more independently, manage setbacks and think critically about data and results. It's been really rewarding!

One of the highlights was getting the opportunity to spend some time in Hobart, Tasmania, working with the UTAS team. It was such a great experience - seeing how collaborative research can be and enjoying a bit of time exploring around as well.

For future students, I'd say don't be afraid to step into something unfamiliar - it can be challenging at first, but it's incredibly worthwhile. Take your time, ask questions and make the most of the support around you. Feel free to contact me any time if you have any questions!

ABSTRACT

Background

Primary open-angle glaucoma (POAG) is a leading cause of irreversible blindness, characterised by progressive retinal ganglion cell loss and visual field (VF) deterioration. Detecting POAG progression is challenging due to subjective clinical assessments and variable progression rates. Optical coherence tomography (OCT) provides objective structural data, and these changes may precede functional visual changes. Artificial intelligence (AI), especially deep learning (DL), shows potential in predicting VF loss from OCT scans, enabling early and more personalised interventions to preserve vision.

Purpose

To develop and validate a Vision Transformer (ViT) based deep learning regression model to predict future VF indices (Visual Field Index, Mean Deviation, Pattern Standard Deviation) from a single baseline OCT retinal nerve fibre layer (RNFL) scan of optic nerve head in patients with suspected or early to moderate POAG, and to assess model performance across different OCT devices (Carl Zeiss and Heidelberg Spectralis).

Method

This retrospective, multi-centre cohort study utilised data from three Australian clinics (Hobart Eye Surgeons, Essendon Eye Clinic, Gladstone Park Eye Clinic, 2009-2025). A total of 1792 eyes from 1610 patients were used for training and internal validation, with 151 and 281 eyes for external validation (Carl Zeiss and Heidelberg Spectralis, respectively). Patients under 18, those with advanced POAG (MD < -12 dB), and scans with artifacts or unreliable VF/OCT data were excluded. The ViT-based regression model was trained on baseline OCT-RNFL scans to predict VF indices (follow-up interval:

4.74 ± 2.59 years). Data preprocessing included contrast adjustment and image normalisation. Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were used to evaluate model performance, with 95% confidence intervals (CI) estimated via bootstrap resampling. Saliency maps visualised influential OCT scan regions. The model was externally tested across Carl Zeiss and Heidelberg Spectralis datasets from two different centres to assess cross-device generalisability.

Results

The ViT model achieved an overall MAE of 2.07 (95% CI: 1.91-2.22) and RMSE of 2.87 (95% CI: 2.60-3.14) on the internal validation set. For specific VF indices, MAE was 3.32% (VFI), 1.78 dB (MD) and 1.10 dB (PSD). On external validation, the model showed comparable performance with an MAE of 2.07 (95% CI: 1.8-2.35) for Essendon (Carl Zeiss) and 2.11 (95% CI: 1.93-2.31) for Gladstone Park (Heidelberg Spectralis). Saliency maps revealed that the RNFL, inner and outer retinal layers were key structures in driving the model's predictions. Bland-Altman plots showed strong agreement for MD and PSD, with VFI showing greater variability. The model matched the Humphrey Visual Field test clinical test-retest variability.

Conclusions

The ViT based regression model accurately forecast VF indices from a single OCT-RNFL scan, offering a novel tool for early POAG progression detection. Its robust performance across two OCT devices supports clinical integration and may be utilised for personalised risk stratification and potentially reducing vision loss through timely intervention. Future research should include diverse ethnic cohorts and multimodal inputs to enhance generalisability and clinical utility.

Kavitha Wilson Rajaratnam

Developing bacterial extracellular vesicles as a vaccine against *Helicobacter pylori*

Supervisor Names and Institute Affiliations:

Prof Richard Ferrero, Gastrointestinal Infection and Inflammation Group

A/Prof Michelle Tate, Viral Immunity and Immunopathology

Centre for Innate Immunity and Infectious Diseases, Hudson Institute of Medical Research



Hi, my name is Kavi, and I completed my BMedSc(Hons) with the Gastrointestinal Infection and Inflammation Group (CiiID, Hudson Institute of Medical Research), following Year 4C. I chose to undertake an Honours year to gain structured research experience and deepen my understanding of gastroenterology. My project focused on *Helicobacter pylori*, and I was fortunate to incorporate clinical exposure through endoscopy and ward-based learning, which made the year especially rewarding.

Throughout the year, I developed a broad range of laboratory skills, including bacterial culture, extracellular vesicle generation and isolation, Western blotting, cell culture, ELISA assays, and the establishment of primary gastric epithelial cell lines. These experiences have been instrumental in shaping my scientific thinking and technical capabilities.

This year has been invaluable for both personal and professional growth. It has strengthened my passion for research and gastroenterology, opened doors for future opportunities, and helped me refine my lab and scientific writing skills.

For students considering Honours, I'd suggest focusing on what you want to learn, rather than fixating on a specific topic. I'm incredibly grateful to my supervisors for their support and can't overstate the importance of finding a good mentor. If you have any questions, feel free to reach out via Facebook or kavithawr@icloud.com.

ABSTRACT

Background

Helicobacter pylori is a bacterium that can persist in the human stomach by evading clearance by the immune system, contributing to chronic inflammation and increasing the risk of gastric cancer. One mechanism by which *H. pylori* may achieve this is through the release of extracellular vesicles (EVs), which carry proteins capable of modulating the immune system. We hypothesised that by identifying proteins with such properties, it may be possible to generate EVs with enhanced immunogenicity that could be used to develop a vaccine against *H. pylori*. This study aimed to: 1) investigate the immunomodulatory effects of EV-associated *H. pylori* proteins on peripheral blood mononuclear cells (PBMCs); 2) identify novel immunomodulatory proteins within EVs; and 3) develop new models to study EV-host interactions.

Method

PBMCs from donors (n=9) were co-cultured with EVs from wild-type (WT) and mutant *H. pylori* strains deficient in *ggt*, *imaA*, *slt*, *tipA*, and *vacA*, which encode proteins with potential immunomodulatory properties. PBMCs were either activated with Concanavalin A (ConA), a T cell mitogen, or left untreated (i.e. without ConA) to investigate immunosuppressive and immunostimulatory effects, respectively. Cytokine production (IL-10 and IFN- γ) was measured by ELISA as an indication of Treg and Th1 pathway activation, respectively. *H. pylori* infection status of PBMC donors was determined by serology. WT EVs were fractionated using anion exchange and size exclusion chromatography (SEC). The eluted fractions were analysed by immunoblotting and mass spectroscopy, then tested for their immunomodulatory properties. To develop a collection of gastric primary cell culture systems, gastric biopsies were processed to establish gastric epithelial cell (GEC) cultures suspended in 3D matrix and then established as monolayers which were exposed to an air-liquid interface to promote mucus production. Gastric mucosoids were incubated with *H. pylori*

WT EVs, and analysed by confocal microscopy, trans-epithelial electrical resistance (TEER), and IL-8 production.

Results

When compared to untreated cells in an immunostimulatory model, WT EVs significantly increased IL-10 ($p < 0.05$) but not IFN- γ production by PBMCs. IL-10 responses to EVs lacking *vacA* were significantly enhanced ($p < 0.001$), whereas EVs deficient in *ggt* and *slt* were decreased, when compared with WT EVs ($p < 0.05$ and $p < 0.01$, respectively). In an immunosuppressive model, WT EVs significantly suppressed IL-10 and IFN- γ responses when compared with untreated cells ($p < 0.05$). EVs lacking *vacA*, *imaA* and *tipA* were found to be more suppressive and *ggt* and *slt* deficient EVs less suppressive than WT EVs in terms of IFN- γ production. There was no clear association between *H. pylori* infection status and PBMC responses. Importantly, chromatography identified EV fractions that were able to suppress IFN- γ and induce IL-10 responses in PBMCs. Immunoblotting indicating that candidate immunosuppressive proteins had a molecular weight between 15-25 kDa and proteomic analysis identifying 33 proteins within this range. Gastric cell models demonstrated that EVs can cross the mucus barrier and interact with GECs without compromising barrier integrity.

Conclusions

H. pylori EV-associated GGT and SLT have immunosuppressive properties and may contribute to bacterial persistence. Several other novel EV-associated proteins, including Lpp20, may induce immunosuppressive effects. Preliminary data suggests that EVs can cross an intact mucus barrier to interact with and induce immune responses in GECs. These findings support the potential of modified EVs as a novel platform for vaccine development against *H. pylori*, by harnessing their ability to deliver immunogenic components while avoiding immunosuppressive effects.



MONASH
University

More information

Faculty of Medicine,
Nursing and Health Sciences
Monash University,
Victoria 3800
Australia

BMedSc(Hons)

Tel: +61 3 9905 6291

Email: med-bmedsc-hons@monash.edu

Web: www.monash.edu/medicine/som/bmedsc-hons



facebook.com/Monash.University



twitter.com/MonashUni