Timing	Title/Speaker
12.00pm – 12.02pm	**Entertainment & Official opening** Prof Kate Loveland, with The Chair (HISS rep)
Research Presentations: Session 1, Chaired by HISS President Paige Riddington	
12:03pm – 12:18pm	**Bianca Fedele,** Dept. of Medicine, *Assessing Sleep during Early Traumatic Brain Injury Recovery*
12:19pm – 12:34pm	**Eva Jenkins,** Dept of Nutrition, Dietetics and Food *Re-licious: Co-designing delicious meals from leftover ingredients*
12:35pm – 12:50pm	**Rana Sawires,** Dept of Paediatrics *Snotwatch: When Data go Viral*
12:51pm – 1:06pm	**Shanal Kumar,** Monash Centre for Health Research and Implementation (MCHRI) *Using continuous glucose monitoring to optimise diabetes care for adults with cystic fibrosis*
Research Presentations: Session 2, Chaired by HISS Vice President, Liam Allan	
1:07pm – 1:22pm	**Chitra Vinnakota,** Dept. of Psychiatry *The role of the GluN2D subunit in mediating NMDA receptor antagonist induced working memory deficits*
1:23pm – 1:38pm	**Alice West,** Hudson/Dept. of Molecular Translational Sciences *Understanding the role of the Asc inflammasome in the development of gastric cancer*
1:39pm – 1:54pm	**Rachna Ram,** Dept. of Surgery *Application of advanced imaging in reconstructive surgery*
1:55pm – 2:10pm	**David Hennes,** Dept. of Obstetrics and Gynaecology *POP! Goes the Mesh. The Future of Reconstructive Pelvic Surgery*
2:11 PM	**Official closing** Prof Kate Loveland, with The Chair (HISS reps)

Speaker Bio and Abstracts

Bianca Fedele, Dept. of Medicine

Ms Bianca Fedele (Hons), is the Clinical Research Manager within the Epworth Monash Rehabilitation Medicine (EMReM) Research Unit, formed through a collaboration of Epworth HealthCare and Monash University. She has an Adjunct Lecturer appointment at Monash University. Ms Fedele successfully completed a Bachelor of Psychology and post-graduate Psychology Honours degree at Victoria University. She is currently enrolled into the Doctor of Philosophy (PhD) degree (part-time) at Monash University which is investigating sleep disturbance during early recovery following a traumatic brain injury (TBI). Within EMReM, Ms Fedele has been involved in studies investigating rehabilitation outcomes following TBI, concussion and stroke.

Assessing Sleep during Early Traumatic Brain Injury Recovery

Bianca Fedele[1,2,3], Gavin Williams[1,2,4], Dean McKenzie[1,3], Robert Giles[1] and John Olver[1,2,3]

[1] Epworth HealthCare, Melbourne, Victoria, Australia
[2] Epworth Monash Rehabilitation Medicine (EMReM) Unit, Melbourne, Victoria, Australia
[3] Monash University, Melbourne, Victoria, Australia
[4] The University of Melbourne, Melbourne, Victoria, Australia

Introduction
Following a traumatic brain injury (TBI), sleep disturbance commonly emerges during early hospital recovery, and whilst patients are in a temporary, confused state of post-traumatic amnesia (PTA). Limited research has evaluated sleep disturbance during PTA. Whilst polysomnography (PSG) is the gold standard in sleep measurement, it has not been trialled during this stage of the recovery process. This study examined sleep quality and sleep macroarchitecture (staging) in patients in PTA using ambulatory PSG. It also measured patients' melatonin levels, a natural body hormone which influences the sleep-wake cycle, via saliva samples. In a subset of patients, measures were repeated after PTA had resolved to evaluate the trajectory of sleep disturbance.

Methods
Participants in PTA were recruited from Epworth HealthCare's inpatient TBI Rehabilitation Unit. Trained nurses administered PSG overnight at patient bedside, using the Compumedics Somté device. On a separate evening, two saliva samples were collected overnight for melatonin testing.

Results
Thirty patients were monitored with PSG, and PSG was repeated in 13 patients after they emerged from PTA. Mean time between injury to initial PSG was 41.3 days (standard deviation [SD]: 27.8). Patients' overall sleep duration was reduced (mean: 5.5hours, SD: 1.3) and appeared fragmented from frequent awakenings (27.8, SD: 14.7). Deep, slow-wave sleep was reduced, or completely absent (40.0% of patients). For 66% of patients, melatonin levels were outside normal ranges. After PTA resolved, patients displayed significantly longer sleep periods (314.2 minutes [PTA] / 382.8 [out PTA], p=.016), however disturbances to other sleep-wake parameters were similar to during PTA.

Conclusions
Gold-standard PSG is feasible for patients in PTA. Results displayed increased disruptions to sleep quality/architecture which persisted after emerging from PTA. There is an urgent need for the surveillance of

sleep disturbance, which is not part of routine hospital assessment, to facilitate appropriate management and reduce long-term impacts.

Eva Jenkins, Dept. of Nutrition dietetics & Food

Eva Jenkins is a Nutrition Scientist from the Department of Nutrition, Dietetics and Food who is passionate about health promotion and sustainability. She is two years into her PhD, which focuses on exploring food waste throughout different systems of the Socio-Cultural Ecological Systems model. Schools are a key setting in the mesosystem, which led Eva to conduct a school-based intervention focusing on healthy eating and food waste reduction with adolescents.

Re-licious: Co-designing delicious meals from leftover ingredients

The Re-licious intervention is an initiative of both Monash and RMIT Universities, aiming to reduce food waste and teach adolescents the importance of sustainability and healthy eating within the secondary school environment. To do so, Re-licious works with Home Economics students across one school term to show them how to use their leftover ingredients to create healthy, delicious meals and reduce food waste. Re-licious follows a co-design methodology utilising both quantitative and qualitative methods. Re-licious was piloted with great success in 2021, with students having increased resourcefulness and intentions to reduce food waste. In addition, qualitative feedback indicated that students enjoyed learning about sustainability at school and had changed their food waste behaviour. The research team has since been awarded an RMIT Sustainable Development Goal grant to create a 'scale up plan' to ensure food waste education becomes part of the school curriculum.

Rana Sawires, Dept. of Paediatrics

A final year PhD student, Rana Sawires has completed four years of her medical degree at Monash University. She has experienced a broad scope of clinical patient care throughout her medical studies but has developed a particular interest in paediatric medicine. Rana pursued paediatric research during her medical degree, completing a BMedSci (Honours) degree in 2020, and beginning her PhD in 2021. Rana hopes to return to complete her medical degree in 2023, and aspires to become a clinical paediatrician while continuing to pursue a research career which focuses on optimising patient care.

SNOTWATCH: WHEN DATA GO VIRAL

Recent innovations in viral respiratory molecular diagnostics allow multiple viruses to be tested simultaneously using multiplex polymerase chain reaction (PCR). Snotwatch is a de-identified ecologic analysis platform capturing population level molecular diagnostic results together with hospital and primary care encounters. This project aims to utilise PCR data to understand the relationship between respiratory virus circulation and febrile seizures at a population level. We have created a novel statistical model for assessing these relationships in both time and space.

Our ecological studies assess relationships between presentations of febrile seizures, chilblains and hepatitis of unknown origin and various respiratory viruses detected in general practices and hospitals across Victoria, Australia. Associations are studied temporally and spatiotemporally through generalized linear regression modelling. Our analysis of febrile seizures showed that their incidence peaked in June-September. Temporal analysis showed febrile seizures were significantly associated with Human metapneumovirus (1.19 risk ratio (RR)), Influenza A (1.49 RR), Influenza B (1.33 RR) and RSV (1.52 RR) (Figure 1). Spatiotemporal analysis supported the association between febrile seizures and Influenza A, Influenza B and RSV (1.25, 1.12 and 1.20 RR respectively, $p<0.01$). A temporal analysis of chilblains showed that COVID-19 diagnoses were associated with a 5.72 risk ratio (RR) of chilblain presentations, and suspected COVID-19 diagnoses were associated with a 3.23 RR. Significantly, no leads or lags were identified between the time of infection and chilblains presentations. In our most recent spatiotemporal investigation of historical hepatitis presentations, we found no significant association was found between hepatitis and any respiratory viruses, including no association with adenovirus.

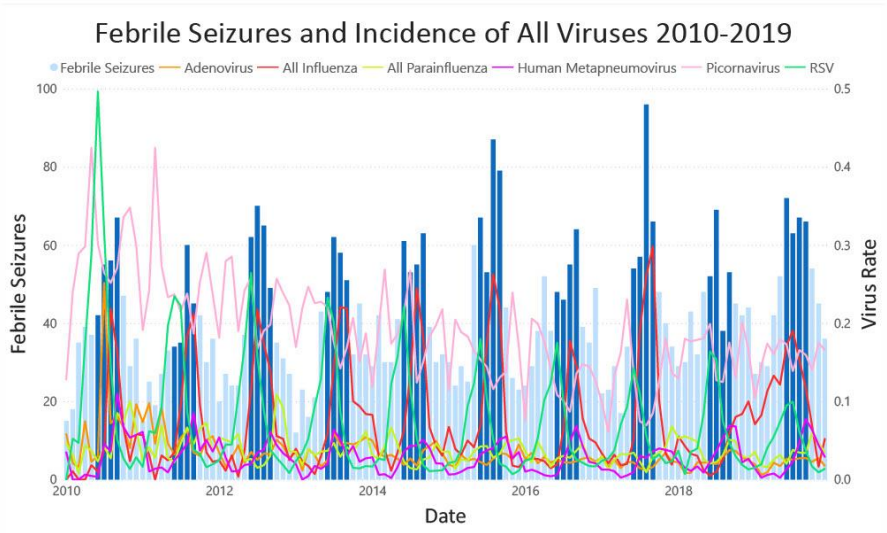

Figure 1: Febrile Seizure Presentations and Virus Rate 2010-2019

Figure 1: Febrile seizures have a winter season peak (dark blue). This corresponds with peak virus rates from 2010-2019.

With the power of large population sizes, our studies highlight the importance of understanding viral circulation patterns and their implications for paediatric health outcomes. Our statistical method has applications in predictive modelling using real-time viral data, which can subsequently inform public health policy.

Shanal Kumar, Monash Centre for Health Research and Implementation (MCHRI)

Dr Shanal Kumar is an adult endocrinologist, general physician and a PhD candidate at Monash Centre for Health Research and Implementation (MCHRI). She obtained her Bachelor of Science majoring in Biomedical Sciences from the University of Queensland in 2007, and subsequently completed her post-graduate medical degree at the University of Melbourne in 2011. She fellowed as an endocrinologist in 2019 after completing her endocrinology training predominantly at Monash and Melbourne Health. Clinically, she has a broad scope of practice working in endocrinology and general medicine. She is also an education fellow for the Australian Diabetes Society and part of their education advisory committee.

Using continuous glucose monitoring to optimise diabetes care for adults with cystic fibrosis

My PhD studies involve evaluating the use of continuous glucose monitoring in the management of people living with cystic fibrosis-related diabetes. Cystic fibrosis-related diabetes can affect up to half of all adults with cystic fibrosis (CF). Presence of diabetes in people with CF is associated with increased morbidity and mortality, with early diagnosis and treatment of hyperglycaemia demonstrated to improve certain clinical outcomes. The ability of continuous glucose monitoring (CGM) to capture hyperglycaemia present in people with cystic fibrosis-related diabetes has the potential to transform their clinical management during both acute illness and stable disease, however research in this space is limited. As a result, most clinical guidelines for people living with cystic fibrosis-related diabetes are extrapolated from evidence gathered from type 1 and type 2 diabetes populations.

The first part of my PhD involved evidence synthesis culminating in two systematic reviews on the use of CGM for the diagnosis and management of cystic fibrosis-related diabetes. We also conducted a national survey of adults living with cystic fibrosis-related diabetes which identified pulmonary exacerbations, requirement for multiple fingerpick blood glucose testing and reduced access to CGM as major barriers to optimal diabetes care. Using this information together with mapping of current clinical services at Monash Health, we developed a pilot implementation trial protocol to evaluate acceptability and implementation outcomes of using CGM to guide intensive insulin therapy in adults with cystic fibrosis-related diabetes hospitalised for the management of a pulmonary exacerbation. Focus groups consisting of local consumers and healthcare provider end-users will be used to help co-design the pilot and develop an ideal model of care that integrates CGM.

Ultimately, my research aims to use CGM to optimise the delivery of clinical diabetes care for adults living with cystic fibrosis-related diabetes attending Monash Health with duplicative benefits of creating a platform that enables high-quality future clinical research in this field.

Chitra Vinnakota, Psychiatry

Chitra is a third year PhD student working in the Behavioural Neuroscience Laboratory at the Department of Psychiatry. For her PhD project, she is investigating the role of a glutamate receptor subunit, GluN2D, in mediating cognition in schizophrenia using a genetic mouse model. She hopes that her research can contribute to a better understanding of cognitive deficits and help improve the quality of life of those with schizophrenia.

The role of the GluN2D subunit in mediating NMDA receptor antagonist induced working memory deficits

Vinnakota C*.[1], Hudson M.[2], Schroeder A.[1], Ikeda K.[3], Jones NC[2], Sundram S.[1,4], Hill R.A.[1]

Keywords: Schizophrenia, Cognition, Working memory, GluNR2D, NMDA receptor antagonists

Introduction: Deficits in working memory (WM) are a core feature of schizophrenia and predictive of functional outcomes, but currently have no treatment. Glutamate NMDA receptor (NMDAR) hypofunction has been proposed to underlie WM deficits and other symptoms in schizophrenia because treatment in healthy humans and animal models with NMDAR antagonists reproduce behavioural and molecular schizophrenia-like phenotypes. The NMDAR subunit, GluNR2D, may mediate the psychosis-inducing effects of the NMDAR antagonist, phencyclidine (PCP) because drug effects are reduced in the GluNR2D-knockout (KO) mouse.

This study aimed to determine if the GluNR2D subunit was relevant in mediating NMDAR antagonist-induced dysfunction in spatial WM in mice.

Methods: GluNR2D-KO male and female mice and their wildtype (WT) littermates (n=44) were assessed on WM using the Trial Unique Non-Matching to Location (TUNL) touchscreen task in the presence or absence of four NMDAR antagonists, MK-801, PCP, S-ketamine and R-ketamine.

Results: At baseline there were no differences in WM between GluN2RD-KO and WT mice. However, PCP impaired WM in WT but not GluNR2D-KO mice (p=0.0035). In contrast, MK-801 impaired WM in both sexes and genotypes while R-ketamine and S-ketamine did not impair overall accuracy in the TUNL task irrespective of genotype or sex.

Conclusion: These data provide support for a novel role of the GluNR2D subunit in mediating PCP but not MK-801 induced WM deficits. This differentiation of NMDAR-antagonist function may provide avenues to investigate the underlying pathology of WM deficits in schizophrenia.

.

Alice West, Hudson Institute/Dept. Of Molecular Translational Sciences

Alice is in the last few months of her PhD in the Cancer and Immune Signalling Laboratory led by Professor Brendan Jenkins in the Centre for Innate Immunity and Infectious Diseases at the Hudson Institute of Medical Research. Alice completed a Bachelor of Science and a Master of Biomedical Science at the University of Melbourne before coming to Monash University to complete her PhD. Alice is studying the role of the Asc inflammasome in the development of gastric cancer in the hope to firstly better understand the mechanisms of action that lead to gastric cancer, but also to find targets that may be used for treatment for this deadly disease.

Understanding the role of the Asc inflammasome in the development of gastric cancer

Inflammasomes are key regulators of innate immunity in chronic inflammatory and autoimmune diseases, however, their role in inflammation-associated gastric tumourigenesis remains uncertain. Given that gastric cancer (GC) is the fourth leading cause of cancer associated death worldwide, it is imperative to determine how inflammation plays a role in tumourigenesis, and therefore the role of inflammasomes, in the hope to identify therapeutic targets to treat and further prevent this disease.

Previously we discovered a pro-tumourigenic role in GC for the key inflammasome adaptor protein, Asc, in a spontaneous mouse model of intestinal type GC, the *gp130*$^{F/F}$ mouse model. It was found that Asc was elevated in over 75% of GC patients and its downstream effects on pro-inflammatory cytokines was investigated. However, the identity of the specific pattern recognition receptor(s) (PRR) that activate this inflammasome, and furthermore the source and nature of the agonists that comprise the pro-tumourigenic Asc inflammasome remain unknown.

To better understand the pro-tumourigenic function of the Asc inflammasome, I firstly studied one PRR, NLRP3, a known modulator of gastrointestinal inflammation, and determined that it is not the associated PRR to the Asc inflammasome in the *gp130*$^{F/F}$ mouse model. In the *gp130*$^{F/F}$ mice, genetic ablation of NLRP3 did not lessen the development of gastric tumours. Subsequently, I undertook a proteomic analysis of *gp130*$^{F/F}$ gastric tumours to determine the identity of the upstream PRRs to the Asc inflammasome and found four candidates. We are now in the process of validating these results. To identify the ligands that activate the Asc inflammasome, I am studying the role of the microbiome in GC. Ablation of certain bacteria in the stomach was achieved through antibiotic treatment, and a smaller tumour burden was observed, indicating that indeed, commensal bacteria may impact tumourigenesis in the *gp130*$^{F/F}$ mouse model. We are now investigating the identity of these bacteria, and the impact more broadly on cellular functions associated to tumourigenesis. Lastly, we have demonstrated that the protumourigenic function of the Asc inflammasome resides within the gastric mucosal epithelium using a conditional knockout model for Asc specifically within the gastric epithelium.

Overall, identifying PRRs that activate the ASC inflammasome in gastric tumourigenesis provides the potential for the development of inflammasome-directed targets for inhibitors for use as anticancer agents in GC.

Rachna Ram, Dept. of Surgery

Rachna Ram is a PhD candidate at the department of surgery at School of Clinical Sciences. With experience in general surgery and plastic and reconstructive surgery at registrar level, her thesis is investigating the application of augmented reality (AR) technology towards visualisation of computed tomography (CT) data for surgical planning. Focusing on breast reconstruction post breast cancer, it is hoped that small blood vessels significant for reconstruction can be mapped in real time in AR. Outside work and research, Rachna enjoys exploring Victoria with her children and family.

Application of Advanced Imaging in Reconstructive Surgery

Introduction

Historically, knowledge in plastic and reconstructive surgery was based on experience, training and dissections. Blood supply to tissue and its vascular territories is key to achieving reconstructive goals. Advanced computed tomography (CT) to identify the dominance of the blood vessels and territories is being increasingly used for surgical planning especially in breast reconstruction.
The aim of this study is to investigate if augmented reality (AR) can be used to visualise the vascular data from CT.

Method

Standard CT angiograms for patients undergoing breast reconstruction after breast cancer with the deep inferior epigastric artery flap (DIEP) were included in the study. The CT images were analysed and reported for surgical planning using 3D volume rendering. Further image analysis techniques were applied to create workflows to convert the CT angiograms for AR viewing. Its utility to the surgical team and target error in perforating vessel mapping is also investigated.

Results

Workflows were able to be developed for 3D and AR viewing.
A feasibility study of 20 prospective patients was able to demonstrate a reliable function of this in image segmentation for 3D reconstruction of vascular anatomy 3D for AR viewing. And preoperative visualisation. Finally, these outputs were used to overlay the 3D models holographically via the AR headset to quantify the target error.

Discussion

Augmented reality technology for vessel mapping in breast reconstruction is a viable concept. It is currently limited by the available hardware technology and its capacity to handle large data sizes. There is limited documentation on medical image transformation for AR viewing and paucity of data on accuracy of real time surgical navigation using image overlay for vessel mapping and planning in breast reconstruction. This study was able to demonstrate the processes, accuracy and quantify target error in relation to anatomical fiducial landmarks.

David Hennes, Dept. of Obstetrics and Gynaecology

Biography: Dr David Hennes is Registrar and current PhD candidate who aspires to a career in Female Pelvic Medicine and Reconstructive Surgery. He works as a Clinician at Monash Health, with honorary research roles at Monash Health and The Royal Melbourne Hospital. He holds a Bachelor of Science in Anatomy, a Doctor of Medicine and a Graduate Diploma in Surgical Anatomy at the University of Melbourne. In his PhD, he works under the supervision of Dr Shayanti Mukherjee, A/Prof Anna Rosamilia, Prof Caroline Gargett and Prof Jerome Werkmeister, in a multidisciplinary team aiming to discover and investigate novel bioengineered grafts for pelvic reconstructive surgery.

POP! Goes the Mesh. The Future of Pelvic Reconstructive Surgery.

D. Hennes[1,2,3], S. Darzi[1,2], J. Alexander[3], M. Kulkarni[3], A. Gora[4], J. Werkmeister[1,2], A. Rosamilia[2,3], C. Gargett[1,2], S. Mukherjee[1,2].

[1]Ritchie Centre, Hudson Institute of Medical Research, Clayton, VIC, 3168, Australia;
[2]Department of Obstetrics and Gynaecology, Monash University, Clayton, VIC, 3168, Australia
[3]Pelvic Floor Disorders Unit, Monash Health, Clayton, VIC, 3168, Australia
[4] Sportmaster Innovation Centre, Singapore, 637143

Introduction

Pelvic Organ Prolapse (POP), defined as descent of the anterior and/or posterior vaginal wall, or the vault, into or past the vaginal introitus, presents an extremely common disease, with a grave deficiency in efficacious and safe surgical treatment options. Synthetic non-degradable polypropylene meshes that were previously used in pelvic reconstructive surgery are now widely prohibited due to life-altering adverse events that women suffered, such as mesh erosion and exposure. There is a critical need to generate novel surgical constructs for applications in pelvic reconstructive surgery that are safe, efficacious, and congruent with host native tissue.

Methodology:

This study applied tissue engineering and stem cell biology to assess the fate and effect of degradable nanostructured poly-L-lactide-co-ε-caprolactone (PLCL) surgical constructs, boosted with sushi domain-containing 2 ($SUSD2^+$) endometrial mesenchymal stem/stromal cells (MSC), in an ovine pre-clinical model of pelvic reconstructive surgery. $SUSD2^+$ eMSC were isolated from human endometrial tissue through fluorescent labelling and magnetic bead sorting, and seeded onto PLCL nanomeshes generated through electrospinning of polymer (10%w/w) at 18kv. Trained surgeons performed posterior vaginal repair on ewes with demonstrated vaginal wall weakness in three randomized groups; sham surgery, PLCL mesh, and PLCL mesh with eMSC. Histology, immunohistochemistry, immunofluorescent microscopy, and scanning electron microscopy were used to assess eMSC engraftment, tissue integration, host foreign body response, angiogenesis and ECM formation in vaginal explants.

Results:

Explanted PLCL grafts had a mean fibril diameter of 485.9nm and mean pore size of 1.5 microns, making them nanostructured. PLCL vaginal explants with and without eMSC demonstrated excellent mesh-tissue integration, with limited smooth muscle, elastin and collagen metabolism observed in comparison with sham surgery. Scanning electron microscopy demonstrated limited ECM degradation, and improved cellular

infiltration of PLCL vaginal implants. Interestingly, eMSCs maintained SUSD2 expression over 90%, even after attaching to PLCL meshes, demonstrating excellent engraftment.

Conclusion:

Nanofiber PLCL grafts are highly biocompatible constructs with huge potential for clinical translation in female pelvic medicine and reconstructive surgery. From a tissue engineering perspective, nanofiber electrospinning can be used to design biomaterials that mimic the matrix, mechanical and cellular properties of host tissue, to potentially improve the tissue microenvironment and reduce the risk of surgical complications.
