ACADEMIC: ABSTRACTS

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Various Authors

Surveillance of endovascular abdominal aortic aneurysm repair with shear wave elastography

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Background
Endovascular aneurysm repair (EVAR) is a minimally invasive treatment for abdominal aortic aneurysm (AAA) often complicated by endoleak, the recurrence of blood flow into the residual aneurysmal sac (RAS). Routine post-EVAR surveillance, via ultrasound imaging, is vital to detect endoleak, preventing aneurysm growth and rupture. Shear wave elastography (SWE) has recently been proposed as an alternative modality. This study assesses the ability of SWE to detect changes in intraluminal thrombus (ILT) density both over time, and with presence of endoleak in the Otago Vascular Diagnostic Laboratory post-EVAR surveillance cohort.

Methods and Materials
Forty-six patients from the surveillance cohort participated, receiving SWE alongside routine surveillance. Insonation of the entire circumferential RAS occurred at three points: its maximum diameter, and levels above and below.

Results
While no overall relationship between ILT stiffness and time post-EVAR was found, a significant increase in a small, repeated subset (n = 3) was observed at one- and three-months post-EVAR ($p = 0.0063$). SWE measurements across the RAS showed no significant difference between patients with (n = 13) and without (n = 40) endoleak ($p = 0.22$). However, a reduction in SWE was observed ($p = 0.035$) when targeted to the exact location of the endoleak within the RAS.

Conclusions
The data indicates SWE can detect short-term, but not long-term, changes in ILT stiffness post-EVAR. While SWE identifies endoleak presence, it is only effective when targeted at the specific endoleak location. Consequently, SWE may not be suitable as a clinical tool for endoleak diagnosis but holds potential as a research tool.

Emergency department versus cardiology management of low-risk chest pain patients

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Background
Chest pain is a frequent reason for patient presentation at the Emergency Department (ED) of Christchurch Hospital. While most of these patients are not diagnosed with acute coronary syndrome (ACS), it is crucial to investigate the possibility of underlying coronary artery disease. Prior to 2022, patients with low-risk chest pain at Christchurch Hospital ED were referred to cardiology for follow-up care. In April 2022, a new pathway based on results from ED findings and investigations was introduced to assist ED physicians to follow-up patients with low-risk chest pain. This study aimed to compare the rates of referral for exercise stress tests (EST) between these two approaches.

Materials and Methods
Patients who presented between 22/05/2021-21/05/2022 at low risk of ACS were analysed as the "cardiology-led" arm. Patients at low risk of ACS who presented between 22/05/2022-21/05/2023 were analysed as the "ED-led arm". All patients were followed up by searching for the International Code of Diseases-10 codes for 'major adverse cardiac events', matched to national health identifiers, in the 12 months following index presentation.

Results
There were 1635 cardiology-led, and 2044 ED-led patients. In the cardiology-led arm 133 patients (7.0%) and in the ED-led arm 133 patients (6.5%) were referred for EST.

Conclusion
ED-led management of minor chest pain is comparable to cardiology-led management in terms of EST referral rates. The ED approach streamlines care, potentially benefiting rural patients with limited access to cardiology specialists. Future research should extend follow-up and investigate characteristics of patients not referred for an EST to identify those warranting referral.

Evaluating a mouse model with a pathological variant for frontometaphyseal dysplasia

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Background
Frontometaphyseal dysplasia (FMD) is a rare genetic disorder characterised by skeletal and soft tissue anomalies. Three genes have been implicated in FMD: *FLNA* which encodes the actin-binding protein filamin A (FLNA), *MAP3K7*, encoding the signalling factor TGFβ-activated kinase 1 (TAK1), and *TAB2* which encodes the TAK1 associated binding protein 2 (TAB2). To further our understanding of this complex disease, a novel mouse model with a pathogenic variant in *Flna*, NM_001110556.2 (NP_001104026.1): c.5169T>G, p.(Cys1723Trp), was engineered.

Materials and Methods
Male mice who had the Cys1723Trp variant were utilised in the phenotyping study. Mice were taken at 1, 3, and 6 months of age (n = 6) and compared to wildtype littermate controls (n = 6). Their skeletal phenotypes were analysed via micro-computational tomography of the femur and calvarium, assessing both cortical and trabecular bone, histomorphometry, and serum markers of bone activity.

Results
No gross anatomical differences between the two groups of mice were noted. No significant differences were identified in either of their cortical or trabecular bone parameters. Histological studies and serum bone markers did not find any remarkable differences between mice with the pathogenic variant and wildtype.

Conclusion
This research highlights the difficulties of creating animal models for skeletal research, emphasising the different anatomical and physiological differences that exist between different mammalian species. Overall, this work highlights the important role negative findings have in the advancement of scientific knowledge and aids in the future direction of FMD-related research.

Effects of continuous glucose monitoring on adherence to time-restricted eating: a randomised controlled trial

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Background
Obesity is a pressing health concern in Aotearoa, prompting the search for effective weight loss strategies. Time-restricted eating (TRE), which limits daily eating to an 8-hour window, has gained popularity due to its alignment with the circadian rhythm and potential for weight loss. However, adherence to TRE can be challenging. This study explores the use of continuous glucose monitors (CGM) to enhance adherence to TRE.

Methods and Materials
Twenty-two participants were assigned to either TRE+CGM or TRE-only groups for 14 days. Participants completed daily diaries and undertook semi-structured interviews. Adherence to TRE was defined *a priori* as maintaining an 8-hour eating window on 80% of days, while CGM feasibility required scanning the CGM thrice daily on 80% of days.

Results
The TRE+CGM group adhered to the eating window for a mean of 10.0 days compared to 8.6 days in the TRE-only group. Both groups had similar mean eating window durations. Five participants in the TRE+CGM group met the TRE adherence criterion compared to three in the TRE-only group. Participants scanned their CGM on average 8.2 times daily, with seven meeting the feasibility criteria. Neither group reported consistent adverse effects. Interviews highlighted increased awareness of eating habits and glucose levels, as well as the positive impact of CGM on TRE adherence and accountability. Most participants expressed willingness to continue using CGM and TRE.

Conclusions
This study suggests that combining CGM with TRE is feasible and may improve adherence, offering a promising strategy for weight loss. Further research should investigate this synergistic approach in larger trials.

The effect of compulsory indications in electronic hospital prescriptions on prescriber behaviour

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Background
Recording the indication for a medicine in the prescription supports communication and reduces errors. On 29/05/2023 the indication field in prescriptions was made compulsory in our local hospital prescribing system. 'To be determined' was also introduced as a selection box for use when the indication is unknown. The aim was to evaluate the effect on prescriber behaviour of making the indication field compulsory for all medicines in the hospital prescribing system.

Materials and Methods
The change in proportion of prescriptions with an indication was compared for eight weeks after introduction of the compulsory indication field to an equivalent eight-weeks in 2022. Text in the indication field was manually classified as an indication, 'other text', 'rubbish text', 'to be determined', or 'blank'. For prescriptions with 'to be determined' initially documented, the proportion with an indication added, dose changed, or prescription ceased prior to discharge was measured.

Results
We analysed 81,646 prescriptions before and 83,427 after indications were made compulsory. The proportion with an indication increased from 29.2% to 75.6% ($p < 0.01$). 'Other text' increased from 2.5% to 14.7% ($p < 0.01$), 'rubbish text' from 0.0% to 2.3% ($p < 0.01$) and 'to be determined' from 0.0% to 6.6% ($p < 0.01$). Of 5,557 prescriptions with 'to be determined' initially documented, 18.1% were ceased and 2.7% had an indication prior to discharge.

Conclusion
Introduction of compulsory indications for medicines increased indication provision substantially, with small increases in other text and rubbish text. Use of the 'to be determined' selection box rarely led to indication provision prior to discharge.

Exploring novel effective connectivity neurofeedback training for treatment of fibromyalgia: A pilot randomised placebo-controlled study.

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Background
Fibromyalgia is a chronic primary pain condition contributing to significant disability worldwide. Neuroimaging studies have identified abnormal effective connectivity between cortical areas involved in descending pain modulation and sensation [i.e pregenual anterior cingulate cortex (pgACC) and primary somatosensory cortex (S1) respectively]. Neurofeedback, a brain-computer interface technique, can normalize dysfunctional brain activity, improving pain and function. The aim of this double-blinded randomised placebo-controlled pilot study was to investigate the safety, feasibility and acceptability of a novel electroencephalography-based neurofeedback (EEG-NF) training protocol, targeting effective connectivity from the pgACC to S1 in the alpha band and exploring its trend of effect on pain and function.

Materials and Methods
Participants with fibromyalgia (N=30; 15 active, 15 placebo) received 12 sessions of either EEG-NF targeting effective connectivity from pgACC to S1, or placebo neurofeedback. Feasibility, safety and acceptability measures were recorded throughout. Pain (Brief Pain Inventory) and function (Revised Fibromyalgia Impact Questionnaire) measures were collected at baseline, immediately (~2 days), ten days and one-month post-intervention.

Results
Descriptive statistics showed feasibility (recruitment rate of 6 participants per month, mean adherence rate of 84.4%, and dropout rate 20%), safety (no adverse events reported), and acceptability (average score 8.0/10). Both groups experienced a marked decrease in pain and functional impact.

Conclusions
We hypothesize reasons for these results, including potential correlations to fatigue at baseline and variability in cortical connectivity. EEG NF training targeting effective connectivity proves a safe, feasible, and acceptable treatment for fibromyalgia. Future studies could validate the methodology and improve the protocol design for a fully powered clinical trial.

Exploring the influence of female reproductive health on gastric function: insights from body surface gastric mapping

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Background
Chronic gastroduodenal disorders (CGD) such as chronic nausea and vomiting syndrome (CNVS), functional dyspepsia (FD) and gastroparesis, are common. Pre-menopausal women experience gastroduodenal symptoms at higher rates; however, the effects of progesterone and estrogen fluctuations on gastric electrophysiology and symptoms are poorly defined.

Materials and Methods
Subjects underwent continuous non-invasive Body Surface Gastric Mapping (BSGM) recording, encompassing a fasting baseline (30 min), 482 kCal meal (10 min) and 4-hr post-prandial recording using a validated wearable device with symptom logging app and validated metrics. Pairwise Wilcoxon tests and post hoc p-value adjustment using Benjamini-Hochberg procedures were used to evaluate gastric electrical activity and symptoms.

Results
Healthy women in the luteal phase of their menstrual cycle had significantly higher principal gastric frequencies (PGF) than women in the follicular phase (mean 3.21 ± 0.17cpm vs. 2.94 ± 0.17cpm, $p < 0.001$) and males (3.01 ± 0.2cpm, $p < 0.001$, p adjusted < 0.001). Pre-menopausal women with CGD who used hormonal contraception had higher PGFs than non-hormonal contraception users (median 3.1cpm [IQR 3.0 to 3.3] vs. 3.0cpm [2.9 to 3.1], $p < 0.001$, p adjusted = 0.004). Pre-menopausal females with CGD were significantly more symptomatic than postmenopausal females and males (all $p < 0.001$), primarily due to higher nausea scores ($p < 0.001$), with contraception users demonstrating significantly higher scores than all other patients (all $p = 0.04$, p adjusted = 0.05).

Conclusion
This evidence base collectively suggests gastric function, and symptoms can be modulated by endogenous and exogenous female sex hormones.

Who develops gestational diabetes mellitus in New Zealand and what are the health outcomes?

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Background
In New Zealand, limited contemporary data exists on who is at risk of gestational diabetes mellitus (GDM), and its associated outcomes. This study aimed to compare the characteristics and health outcomes of pregnant women in New Zealand with and without GDM.

Materials and Methods
Women and their infants with available sociodemographic, medical history and health outcome data were eligible. Analyses used logistic regression, log binomial regression, log Poisson models, and linear regression to assess GDM risk factors and health outcomes.

Results
Among 3,756 mothers, Māori and Pasifika women had similar GDM risk to NZ European women (adjusted odds ratios [aOR] 0.98, 95% CI 0.57-1.69, $p = 0.95$, and aOR 0.98, 95% CI 0.57-1.69, $p = 0.90$ respectively), while Asian and other ethnicities had higher GDM risk (aOR 2.75, 95% CI 2.10-3.61, $p < 0.0001$, and aOR 1.82, 95% CI 1.16-2.86, $p = 0.009$ respectively). Other risk factors for GDM included maternal age ≥25 years, body mass index ≥25, family history of diabetes, and primiparity. When comparing GDM and non-GDM groups, no significant differences were observed for the risk of caesarean section (adjusted relative risk [aRR] 1.02, 95% CI 0.90-1.15, $p = 0.81$) or a large-for-gestational-age infant (aRR 1.02, 95% CI 0.74-1.42, $p = 0.89$). Poor gestational weight gain, antenatal hospitalisation, labour induction, earlier gestational age at birth, longer postnatal stay, macrosomia, neonatal hypoglycaemia and hyperbilirubinemia were associated with GDM.

Conclusion
This study contributes to the understanding of risk factors for GDM and associated health outcomes in contemporary New Zealand, pro-

viding a foundation for future research and interventions to reduce its burden.

Turning the problem into the solution: leveraging tumour heterogeneity with multiplex immunohistochemistry and machine learning to enable personalised glioblastoma diagnosis.

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Background
Glioblastoma (GBM) is the most common and fatal primary brain tumour in adults. Extensive GBM tumour heterogeneity is considered a key underlying obstacle that complicates diagnosis and the tailoring of personalised medicine. Currently, multi-omics methods are available to address this problem, but they are time- and resource-expensive and are not readily available. This is creating access barriers that place downstream burdens on our health system and perpetuate inequity in treatment outcomes. With advances in multiplex immunohistochemistry (mIHC) and machine learning, there is potential to develop a readily-accessible, image-based, personalised diagnostic system that reduces reliance on the multi-omics technologies.

Materials and Methods
Tissue sections from 56 donated GBM tumours (The Neurological Foundation Human Brain Bank) underwent mIHC techniques for nine key GBM-associated cell-type and microenvironment-specific markers. The adjacent sections underwent H&E pathohistological staining. These were all imaged using the Vectra Polaris™ microscope. Machine learning algorithms developed by our colleagues at the Auckland Bioengineering Institute (ABI) were used to associate pathohistological single-cell features with specific protein marker expressions using the SCIMAP toolkit within PyCharm.

Results
Single-cell image analysis of the multiplexed markers revealed that discrete cell types clustered in association with prognostically-relevant tumour microenvironments, such as perivascular or perinecrotic regions. These data are currently being associated with patient clinical outcomes to determine their prognostic significance.

Conclusion
In aid of a 5-year project, my work helped to establish the single-cell mIHC analysis and its association with routine histology H&E features, paving the way to achieving personalized diagnosis from routine pathohistological stained images.

Novel point of care monitoring of oxidative stress in abdominal surgery

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Background
Oxidative stress (OS) is associated with pathophysiological processes and in the body's response to surgery. Monitoring OS remains a technical challenge and the optimal measurement method is uncertain. We aimed to:
1. Conduct a systematic review evaluating the perioperative monitoring of OS in patients undergoing abdominal surgery, and
2. Develop and pilot voltammetry (VLM) as a method of measuring 2 antioxidants in the perioperative period

Materials and Methods
The relevant papers were obtained. The literature search results were independently checked by a second reviewer and data extracted. VLM was developed by incorporating a bespoke electrode into a calibrated potentiometer device. Blood sampling, centrifugation and testing were performed to refine the VLM technique. The refined protocol was utilised on a single patient who underwent a pancreaticoduodenectomy with VLM plasma levels of ascorbic acid (AA) and uric acid (UA) as primary endpoints. Conventional markers of OS were also analysed as secondary endpoints.

Results
20 studies were included. OS generally increases postoperatively, however, there is lack of consistency in the OS biomarkers used. *In vivo*, VLM demonstrated depletion of both UA and AA (increased OS) in the first 24 hours.

Conclusion
There is an increasing body of evidence that OS is influenced by surgery. Our results suggest that VLM is a promising method of measuring OS in 'real-time' in the clinical environment. An extension of this work will explore the correlation between VLM measurements and conventional OS biomarkers.

Comparing neuromyelitis optica spectrum disorder (NMOSD) and myelin oligodendrocyte glycoprotein antibody disease (MOGAD)

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Background
Both NMOSD and MOGAD are immune-mediated CNS inflammatory diseases with habitual relapses. Both diseases often affect optic nerves in the form of optic neuritis. This study aims to evaluate any ophthalmic similarities and/or differences between the patients with each disease in New Zealand.

Materials and Methods
Patients with a confirmed diagnosis of NMOSD and MOGAD were recruited retrospectively from Neurology/Neuro-Ophthalmology centres in Auckland and Waikato since 2011. The patient data, including their demographics, clinical features and treatment summary, were recorded into a web-based database. Statistical data analysis was done to compare the two diseases, including multivariate regression analysis on the patient's visual outcome.

Results
In total, 85 MOGAD and 31 NMOSD patients were included in the study. The NMOSD cohort has shown a stronger female dominance over MOGAD, with 71.0% (n = 22) of the patients being female compared to 56.5% (n = 48), respectively. On the other hand, the MOGAD cohort has shown a greater paediatric involvement with paediatric patients (age at onset < 16 years), making up 31.8% (n = 27) of the cohort, while only 9.7% (n = 3) in NMOSD. Both diseases exhibited similar frequencies of clinical phenotypes, with optic neuritis and transverse myelitis being the two most common clinical features. NMOSD patients generally resulted in poorer visual outcomes compared to MOGAD patients.

Conclusion
This study provides the first stand-alone NZ perspective of NMOSD/MOGAD. Most findings agree with the literature and studies on other NMOSD/MOGAD cohorts globally, with some unique findings also.

Building BBM together: evaluating BBM motivation

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Background
Brown Buttabean Motivation (BBM) is a community-based, Māori and Pacific-driven organisation in South and West Auckland. BBM provides free exercise bootcamps, alongside additional supports. Evaluation is called for given BBM's anecdotal evidence of sustained weight loss. Sustained engagement in an exercise or weight loss programme is shown to be a predictor of weight loss maintenance. Community-Based System Dynamics (CBSD) is an empowering process that enables indigenous knowledge and effective problem-solving.

Materials and Methods
The CBSD methodologies of cognitive mapping interviews (CMIs) and group model building (GMB) were used to understand members' perspectives on the drivers and consequences of engagement with BBM. Two CMIs took place in preparation for three GMB workshops. Activities derived from the online resource, Scriptapedia, were executed to produce a causal loop diagram (CLD). Participants suggested interventions to improve engagement based on the CLD.

Results
The CLD identified five themes of BBM culture, mindset, social network, hauora and community support programmes, and the underlying context of Māori and Pacific culture. The CLD showed that mutual accountability, story sharing, BBM messaging and mental health benefits were drivers of engagement. Social media worked to amplify these drivers. The focus of the participant-generated interventions was whakawhanaungatanga (relationship building).

Conclusion
This research depicts members' perspectives on the drivers and consequences of engagement with BBM. This information is useful in supporting BBM's sustainability and growth. Preliminary recommendations include increasing whakawhanaungatanga, nutrition education, and leadership mentoring. The CLD can also more broadly inform Māori and Pacific-targeted support programmes.

Characterising astrogliosis in the post-mortem human Huntington's disease neocerebellum

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Background
Huntington's disease (HD) is a genetic neurodegenerative disorder with no progression-modifying therapeutics. Prior studies have established links between neurodegeneration patterns across various brain regions and the manifestation of motor or mood symptom profiles. Particularly, significant Purkinje cell loss within the cerebellum is observed only in HD cases with predominantly motor symptoms. While the underlying mechanisms driving neurodegeneration remains unclear, increasing evidence would implicate non-neuronal cells in disease pathogenesis. Therefore, by investigating astrocytes, a non-neuronal cell crucial in maintaining neuronal homeostasis, and its involvement in the HD cerebellum, this project aims to reveal symptomatically relevant neuropathological events which may further our understanding of the clinical manifestation of HD.

Materials and Methods
Free-floating fluorescence immunohistochemistry was conducted on post-mortem human cerebellar tissue from 8 HD and 4 control cases to investigate the expression patterns of glial fibrillary acidic protein (GFAP) in astrocytes.

Results
Preliminary examination of GFAP+ immunoreactivity patterns suggests an enhancement in protein expression of the HD cohort relative to the controls. Further subcategorisation of the HD cases into symptom profiles would suggest an increase in GFAP+ expression in the HD cases with a predominant motor symptom profile.

Conclusion
Evidence from this thesis demonstrates the presence of astrogliosis within the HD cerebellum and would suggest that reactive astrocytes may be a contributor to the symptom-specific pattern of HD cerebellar dysfunction. While further analysis is required, these findings provides the rationale in detailing HD cerebellar changes to reveal novel perspectives on the heterogenous clinical presentation of HD.

Characterising orphan hippocampal p62 pathology in amyotrophic lateral sclerosis.

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Background
Amyotrophic lateral sclerosis is a rapidly progressive neurodegenerative disease that can be caused by mutations to a variety of genes. Elucidating the cause on a case-by-case basis can often be difficult, given that a significant proportion of cases seemingly possess no identifiable mutations. A form of pathology found recently in cases of amyotrophic lateral sclerosis consists of a protein named p62 that normally labels neurodegenerative protein aggregates. P62 was aggregating without several known causes of amyotrophic lateral sclerosis, however. We hypothesise that p62 is labelling the mutant protein product of an unidentified mutant gene in these cases. Analysing what proteins are involved in these aggregates will help us better understand this pathology and may lead to the discovery of novel causative genes of amyotrophic lateral sclerosis.

Materials and Methods
Aggregates of orphaned p62 were assessed through fluorescent immunohistochemistry. Antibodies to several potential causative proteins, adaptor proteins and cell-type markers were used to stain the hippocampus of cases with these aggregates and the results were imaged.

Results
Thus far, two familial cases of orphan p62 pathology have been explained by mutant protein products that match the inherited mutation. This gives us hope that our hypothesis is true and that further unexplained cases will exhibit a mutant protein product alongside p62 that matches an acquired or inherited mutation.

Conclusion
This project's experimental work and results have not been completed, and further work is required before I can provide a conclusion.

Antibiofilm activity of novel polymyxin B analogues

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Background
Antimicrobial resistance poses a serious threat to global health. The growing prevalence of multi-drug resistant organisms necessitates the development of new antimicrobials to combat this. Polymyxin B (PMB) is currently a last-line antibiotic used for infections caused by Gram-negative bacteria. These infections are difficult to treat due to their ability to form biofilms, which are communities of cells within a protective extracellular matrix. The work leading up to this project has produced three novel polymyxin analogues, which have a better safety profile than PMB, but unproven antibiofilm efficacy. These compounds are JW-9K, JW-9G, and AC4.120. Two of these compounds, JW-9G and AC4.120, are 10-fold less toxic than the native compound in kidney organoid models.

Materials and Methods
Laboratory strains of *Pseudomonas aeruginosa* 27853, *Klebsiella pneumoniae* 35596, and *Acinetobacter baumannii* 19606 were grown as biofilms using the Calgary Biofilm Device. These biofilms were then treated at different concentrations of the polymyxin analogues for 24 hours. The minimum biofilm eradication concentration (MBEC) was established by culture on tryptic soy agar.

Results
All three novel compounds demonstrated non-inferior efficacy against P. aeruginosa biofilms when compared to standard PMB. Against biofilms formed by *K. pneumoniae* and *A. baumannii*, only AC4.120 demonstrated similar efficacy. It was most effective against *P. aeruginosa* biofilms, with a median MBEC of 48 μg/mL vs. 32 μg/mL for PMB ($p = 0.314$).

Conclusion
This study has highlighted one of the analogues as having similar antibiofilm efficacy to native PMB. This analogue warrants further investigation using Gram-negative clinical isolates.

Resonance Raman spectroscopy as a tool for evaluating regional oxygenation *in vivo*

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Background
Tissue oxygenation is an important risk factor for post operative complications across several surgical specialties, impacting procedures such as the Whipple's procedure and breast reconstruction surgery. At present, identification of potentially compromised tissue is challenging as intraoperative techniques for assessment of local tissue oxygenation are limited, each with their disadvantages. This pilot study was undertaken to determine if Raman spectroscopy is a viable technique for measuring regional tissue oxygenation changes.

Materials and Methods
Resonance Raman spectroscopy (RRS) was used to determine changes in the oxygenation status of haemoglobin in various organ tissues both *in vitro* and *in vivo*. This was achieved by tracking the spectral shift in the symmetric ring stretching mode of the haemoglobin molecule, whose frequency is dependent on the oxygenation status of haemoglobin. RRS measurements were taken using an Ocean Insight QEPro Raman spectrometer, custom-made fibre optic probe, and laser excitation at 410 nm. A series of *in vitro* studies first characterised the device's performance. Next, anaesthetised rodents underwent open laparotomy to obtain access to the duodenum, pancreas and kidney for measurement. RRS changes were measured during reversible regional ischemia induced by placement and removal of atraumatic Biemer clamps for each organ. Finally, changes in RRS was explored by inducing a gradient of ischemia along a skin flap (MacFarlane flap).

Results
RRS was able to reliably track regional oxygenation changes in each organ. RRS also detected the gradient of deoxygenation along the skin flap.

Conclusion
RRS exhibits promise as an intraoperative tool to detect real-time local tissue oxygenation.

Testing the clinically-relevant kappa-opioid-receptor agonist, nalfurafine, as a potential treatment for spinal cord injury

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Background
Spinal cord injury (SCI) is a life altering neurological condition. Currently, there are few treatment options for improving neurological outcomes following SCI. In other CNS diseases kappa-opioid-receptor (KOR) agonists have been shown to modulate inflammation, the immune response and remyelination, all key components of SCI. In this project we are exploring the use of the KOR agonist, nalfurafine as a neuroprotective agent for SCI. Objectives: to examine if administering nalfurafine can reduce inflammation, promote remyelination and improve functional recovery in a rodent model of contusive spinal cord injury.

Materials and Methods
Twenty-four Sprague Dawley rats were randomized into 3 groups and subjected to a moderate SCI contusion (175kdyne) using an Infinite Horizons Impactor. Animals were administered nalfurafine (0.1 mg/kg or 0.03 mg/kg) or vehicle daily for 4 weeks. The Basso Beattie and Bresnahan (BBB) locomotor scale and the Error Ladder were used to assess gross and fine motor function, respectively. Spinal cord tissue was sectioned for immunohistochemical analysis of changes in lesion size, astrocyte and microglia phenotypes.

Results
Tissue sectioning and immunohistochemistry is completed. Analysis of astrocyte and microglial number, between the groups will be presented. BBB and Error Ladder analysis has been carried out and will be unblinded following the immunohistochemical analysis.

Conclusion
Preliminary data suggests there may be reduction in inflammation due to nalfurafine between the 3 groups. Study needs to be unblinded for further insight.

Ocular surface in health and diabetes: from young children to young adults

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Background
Diabetic neuropathy is one of the most common complications of diabetes. *In vivo* confocal microscopy (IVCM) of the cornea is a non-invasive tool that can detect small nerve fibre changes. These changes in corneal nerves occur prior to clinical peripheral neuropathy. Corneal nerve alterations have been observed in adult patients with diabetes using confocal microscopy, but limited research has been conducted in the paediatric and adolescent population. Objective: to assess ocular surface health, corneal nerve microstructure, corneal sensitivity, and peripheral neuropathy, in children and young adults with type 1 diabetes.

Materials and Methods
Participants from paediatric and adolescent diabetes clinics and age-matched controls were recruited. Neurological tests - Michigan Neuropathy Screening Instrument questionnaire (MNSI) and biothesiometry; and ophthalmologic assessments including the dry eye questionnaire (DEQ-5), non-contact corneal aesthesiometry (NCCA), keratography (K5M), and IVCM.

Results
Forty-two participants (8 to 29 years old, 19M, 23F), including 25 controls and 17 of those with type 1 diabetes were examined. Results show no signs of peripheral neuropathy and no statistically significant difference in ocular surface health, DEQ-5, or K5M measures . Statistically significant differences were noted in corneal nerve fibre length (17.2 ± 3.81 mm/mm2 in controls compared to 13.7 ± 3.53 mm/mm2 in those with diabetes ($p = 0.007$)) and corneal sensitivity threshold ($p = 0.047$).

Conclusion
There is a significant decrease in corneal nerve fibre length and corneal sensitivity in patients with diabetes, without any manifestation of peripheral neuropathy. IVCM can be an important biomarker for peripheral neuropathy in patients with diabetes.

EPIC PLEFF study: Exploring the Prognostic ImpaCt of PLeural EFFusion in the intensive care unit

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Background
Pleural effusion (PLEFF) is frequently encountered in intensive care unit (ICU) patients, yet its impact on clinical outcomes remains inadequately explored. Our study aims to uncover the prognostic value of PLEFF in adult ICU patients, focusing on in-ICU mortality. Secondary outcomes include in-ward and in-hospital mortality, survival analyses, length of stay (LOS), need for invasive ventilation, and daily sequential organ failure assessment (SOFA) scores.

Materials and Methods
We utilised the Medical Information Mart for Intensive Care (MIMIC)-IV database with over 70,000 ICU stays spanning a decade. PLEFF events were identified using international classification of diagnosis (ICD) codes, radiology reports, and laboratory results. After propensity score matching, statistical analysis of the clinical outcomes includes Fisher Exact and Welch unpaired t-tests for categorical and continuous variables, respectively, and two-way ANOVA for daily SOFA scores. We also examined PLEFF's association with five common diseases and considered treatment approaches of pleural drainage and invasive ventilation.

Results
PLEFF significantly elevated in-ICU mortality (Odds Ratio (OR) = 1.365; $p < 0.0001$), ward mortality (OR = 2.335; $p < 0.0001$), in-hospital mortality (OR = 1.738; $p < 0.0001$), need for ventilation (OR = 1.761; $p < 0.0001$), LOS ($p < 0.0001$ across all locations), and daily SOFA scores (Interaction: $p < 0.0001$), compared to the non-PLEFF cohort (n = 7,540 each cohort). Disease subcategories and treatment analyses revealed diverging patterns in ICU mortality and other clinical outcomes.

Conclusion
Our study informs clinical trials and decision-making in the ICU by highlighting PLEFF's prognostic significance across critical clinical outcomes. Subcategory analysis and treatment considerations offer specific avenues for timely interventions and research directions to reduce mortality in PLEFF ICU patients.

Digital solutions in perioperative surgical care

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Background
Digital solutions within perioperative surgical care have potential to reduce workload and improve outcomes. A summary of digital tools used by patients preoperatively, and clinical testing of wearable devices to monitor patients perioperatively is needed.

Material and Methods
A scoping review was completed that summarised digital tools that are used by abdominal surgical patients preoperatively. Also, a prospective observational feasibility study was conducted to trial the use of the Zephyr biopatch in general surgery patients. Continuous vital sign monitoring was completed, and data collected on usability through questionnaires/scales and device accuracy through Bland-Altman analysis.

Results
The review identified mobile apps and wearable devices used preoperatively by patients. Studies assessed feasibility of the digital tools or used them to predict a clinical outcome such as complication rate. Most studies focused on wearable devices that measured physical activity metrics such as step counts. The feasibility found that the Zephyr device overestimated HR by around 1.1 bpm (+/- 6.7), underestimated by 1.0 breath/min (+/- 3.3) and overestimated by 0.53 degrees Celsius (+/-0.41), compared to nurse-led measures. In addition, the patients generally rated the experience positively, with a System Usability Score of 80.25, representing a very acceptable system.

Conclusion
The results show that digital tools, are generally well accepted by patients and have potential to improve clinical outcomes. The Zephyr device was clinically accurate compared to nurse measurements.

Future studies should focus on how digital tools can be used within structured preoperative interventions such as prehabilitation.

How PREP2 predictions are used to guide upper limb rehabilitation for stroke patients

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Background
The PREP2 prediction tool is used acutely post-stroke to predict upper limb (UL) functional outcomes at 3 months. It uses transcranial magnetic stimulation to evaluate the functional integrity of the corticospinal tract (CST) through the presence of motor evoked potentials (MEPs) on electromyography recordings. Patients with an intact CST, deemed MEP+, are predicted to make most or all of their UL functional recovery. Those without an intact CST, classed MEP-, are predicted to make minimal to no recovery. These predictions can be used to guide patients' rehabilitation goals. The aim was to investigate whether upper limb rehabilitation content differed depending on the patients' predicted functional outcomes.

Materials and Methods
Fourteen MEP+ and six MEP- stroke patients were assessed for their UL motor impairment, function, sensation and cognition within 2 weeks and at 3 months post-stroke. One therapy session was observed to record the composition of unimanual and bimanual motor tasks.

Results
MEP+ participants spent a greater proportion of unimanual therapy using their paretic UL than MEP- participants. MEP status did not affect the composition of bimanual therapy. Participants with their dominant hand affected by stroke spent a greater proportion of time performing bimanual asymmetric tasks than those with their non-dominant hand affected.

Conclusion
These results indicate that MEP status significantly influences the composition of unimanual therapy, while the hand affected by stroke affects the composition of bimanual therapy. These findings contribute to knowledge on tailoring individualised rehabilitation goals for stroke patients based on PREP2 predictions.

Out in health: gay and bisexual men's experiences of communicating sexuality and sexual health with healthcare providers in New Zealand

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Background
Gay, bisexual, and other men who have sex with men (GBMSM) in New Zealand (NZ) are disproportionately impacted by human immunodeficiency virus (HIV) and other sexually transmitted infections (STIs). Recent biomedical innovations like pre-exposure prophylaxis offer new prevention tools, yet their use predicates on GBMSM disclosing their sexuality and discussing sexual health with healthcare providers (HCPs). We aim to describe which GBMSM are out to their general practitioner (GP), examine associations between disclosure and comfort discussing sexual health with prevention and testing, and understand GBMSM's experiences of sexual healthcare.

Materials and Methods
We analysed data from HIV-negative GBMSM participating in the Sex and Prevention of Transmission Study, a national, repeat cross-sectional HIV biobehavioural surveillance survey. We used binary logistic regression to investigate associations with GP disclosure, and associations between disclosure and comfort with prevention and testing. We undertook a thematic analysis to synthesise free-text responses about GBMSM's negative experiences talking about sexuality and sexual health with HCPs.

Results
The quantitative sample comprised 2819 participants. Overall, 62.1% were out to their GP. Disclosure varied by age, ethnicity, education, and sexual identity. Comfort and disclosure patterned prevention and testing. When discussing sexuality and sexual health, GBMSM encountered HCPs who were judgemental and prejudiced, disrespectful, discriminatory, and inexperienced or non-competent.

Conclusion
In the era of HIV biomedical prevention, many GBMSM face barriers to appropriate sexual healthcare. Health promotion, targeted services, and workforce training are needed to foster accessible healthcare environments for GBMSM and achieve elimination of HIV transmission in NZ by 2030.

Improving topical intranasal corticosteroid efficacy and patient compliance

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Background
Chronic rhinosinusitis is sinonasal mucosa inflammation lasting >3 months, characterised by cold-like symptoms which significantly reduce quality of life. Standard treatments include intranasal corticosteroid sprays, antibiotics and sinus rinses, which may contain dissolved corticosteroids. Patient treatment adherence is a barrier, and limited studies exist on the retention of rinse volume in the sinuses. Two studies were undertaken; a crossover trial determining device preference, and a study measuring the rinse volume retained in the sinonasal cavity.

Materials and Methods
Our group developed a novel adaptor that fits onto a metered dose inhaler. During the crossover trial, patients used this device for three weeks, then used Flixonase nasal spray for another three weeks. Preference and symptom scores were collected for comparison. In the retained rinse study, another group of participants performed a sinus rinse with a NeilMed bottle. The pre and post-rinse volumes were measured to deduce the retained volume.

Results
Most participants in the crossover trial reported higher compliance and preference for the novel adaptor + MDI, over standard nasal spray. There was no significant difference in symptom control. The average volume retained in the sinonasal cavity was 11.9 mL (range 2.5-22.3 mL), which is 5.27% (1.14-9.44%).

Conclusion
Patient preference for the nasal adaptor + MDI over standard nasal spray could result in improved adherence and patient outcomes post-operatively. The volume retained in the sinuses post-rinse is small and variable between patients. This is a crucial step given corticosteroids and antibiotics are often added to treatment.

Texture analysis as a biomarker for Alzheimer's disease

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Background
In Alzheimer's disease (AD), conventional magnetic resonance imaging (MRI) biomarkers have focused on macroscopic neurodegeneration via atrophy assessment. However, recent investigations suggest Texture Analysis (TA) may capture microstructural changes associated with earlier AD pathology. Aim: this study seeks to investigate the utility of TA as a biomarker for AD in a New Zealand Cohort.

Materials and Methods
T1-weighted MRI data from 36 control (C) participants, 61 individuals with subjective cognitive decline (SCD), 109 with mild cognitive impairment (MCI), and 25 AD participants, recruited from the NZ-DPRC, was employed. A subset of Haralick texture features was extracted from regions of interest (ROIs), initially the hippocampus, with planned work to include the entorhinal cortex, parahippocampal gyrus, and perirhinal cortex. Group-wise differences in texture features within left and right hippocampal ROIs were analysed using a MANOVA. In addition, machine-learning was employed to test the accuracy of classifying individuals into cognitively normal and cognitively-impaired groups.

Results
MANOVAs revealed that three texture features (correlate, sum average, and sum variance) were significantly different across disease groups in the left hippocampus and two features (sum average and sum variance) in the right hippocampus. Unexpectedly, the classifier using hippocampal texture only achieved an accuracy of 52.8%. In comparison, hippocampal volume achieved a classification accuracy of 63.2%.

Conclusion
Preliminary findings suggest that hippocampal texture may be less effective as a biomarker for AD than the more conventional measure of hippocampal volume. This warrants further testing of the processing pipeline, but may indicate texture features are not reliable markers of AD.