2015/16 SUMMER STUDENTSHIP PROGRAMME

LAY REPORTS

University of Otago, WELLINGTON

Whāre Wananga o Otago ki Te Whanga-Nui-a-Tara

INTRODUCTION

This booklet is a compilation of the lay reports submitted by student participants in the University of Otago, Wellington 2015/2016 Summer Studentship Programme.
This year 32 students and over 40 supervisors took on the task of a ten-week research project.

The main objective of the Summer Studentship programme is to give undergraduate medical and science students their first introduction to research, this is a very important opportunity to encourage and foster future New Zealand researchers.

LIST OF SPONSORS

The Summer Studentship Programme relies heavily on the financial generosity of external organisations, individuals and departments that contribute a $5,000 educational stipend for each project.

We are grateful for the generous donations from:

- The University of Otago Research Committee
- The Surgical Research Trust
- Phil and Ted
- He Kainga Oranga and Health Research Council
- Arthritis New Zealand
- New Zealand League Against Epilepsy (NZLAE)
- Maurice & Phyllis Paykel Trust
- Diabetes Wellington
- Wellington Faculty of the RNZCGP
- The Cancer Society of New Zealand – Wellington Division Inc
- National Heart Foundation
- Neurological Foundation of New Zealand
- PHARMAC
- CENOR
- BODE, Dept of Public Health, UOW
- Mid-Central District Health Board
- Cure Kids
- Tairawhiti Complementary & Traditional Therapies Research Trust, Hauora Tairawhiti
- Capital Cardiovascular Research Trust
- University of Otago, Wellington
- Department of Surgery & Anaesthesia, UOW
- New Zealand Society for Geriatric Medicine
- Department of Paediatrics, UOW
- CALT Award; Dept. Pathology HOD Research Fund
- Wellington Asthma Research Group
- Department of Medicine, UOW
- Neurology Department, Capital and Coast DHB
- Associate Professor Jeremy Krebs
- Health Research Council of New Zealand

ORAL PRESENTATION COMPETITION

We would like to acknowledge and thank the School of Medicine & Health Sciences, UOW for the financial contribution towards the Summer Studentship Oral Presentation prize.

The written reports were all evaluated to produce a list of the top four best reports.

The four finalist students were:

- Shaun Collings
- Tim Foster
- Bonnie White
- Dhenisha Dahya

Shaun Collings and Tim Foster were judged the two joint winners of the 2015/16 Summer Studentship Oral Presentation Competition. Shaun investigated Innate-like T cells in prostate cancer under the supervision of Dr. Robert Weinkove; this educational stipend was sponsored by the Cancer Society of New Zealand – Wellington Division Inc. Tim investigated Hospital Readmissions in Childhood under the supervision of Dr. Nevil Pierse and Jane Oliver; this educational stipend was sponsored by the He Kainga Oranga and Health Research Council.

The runner-ups were Dhenisha Dahya under the supervision of Dr. Carol Johnson and Bonnie White under the supervision of Dr. Rebecca Grainger and Dr. Karen Day.

We would like to thank Dr. William Levack and Associate Professor Rob Siebers for undertaking the difficult task of assessing the final reports and judging the oral presentations.

These reports are a small reflection of the enormous amount of work and commitment by the students, staff, departments and sponsors. We hope that you will enjoy reading them and we look forward to your support for the 2016/2017 programme.

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School of Medicine & Health Sciences,
University of Otago, Wellington

Summer Studentship – Joint-Winner

Shaun Collings

Innate-like T cells in prostate cancer

Supervised by Dr. Robert Weinkove

Sponsored by Cancer Society of New Zealand (Wellington Division)

Prostate cancer is a common cause of mortality in New Zealand. Treatment with therapies that manipulate the immune system have shown some success in terminal prostate cancer patients. A small group of immune cells, innate-like T cells, communicate between the basic and advanced immune systems and are being considered for use in cancer vaccines. We aimed to investigate the baseline population and proliferative capability of three cell types: mucosal-associated invariant T (MAIT) cells, cells with the Vγ9+ Vδ2+ T cell receptor (Vγ9Vδ2 cells) and invariant natural killer T (iNKT) cells.

We collected venous blood from 20 patients and 18 healthy control participants. Immune cells were isolated and either analysed immediately using flow cytometry or after seven days in cell culture with specific ligands for each cell type.

In the baseline cell profile, we found a significant difference in the proportion of immune cells that express T cell markers between patients and controls. No other differences were found. After culture with specific cell ligands, MAIT cells and Vγ9Vδ2 cells were found to expand in a similar manner between patients and controls. However, iNKT cell proliferation was found to be impaired in patients.

This study is the first, to the authors' knowledge, that profiles MAIT cells and Vγ9Vδ2 cells in prostate cancer. It is also the first to show an inability of iNKT cells to proliferate in stabilised prostate cancer patients. This has implications for the development of vaccines, and raises questions about why iNKT cells are selectively impaired in prostate cancer.

Summer Studentship – Joint-Winner

Tim Foster

Hospital Readmissions in Childhood

Supervised by Dr. Nevil Pierse
& Jane Oliver

Sponsored by He Kainga Oranga and Health Research Council

This project investigated the risk factors that could explain why children get readmitted to hospital after being discharged. In particular, we thought that readmissions could be driven by housing-related diseases, given recent research showing that poor quality housing in New Zealand has clear effects on the health of the country's children.

We used the Ministry of Health's database of hospital admissions, which allowed us to analyse 1.3 million hospitalisations between 2000 and 2013 from 640,000 children aged 1-15. We then investigated the relationships between deprivation (our measure of socioeconomic status), ethnicity and housing-related diseases on the risk of children being readmitted.

We found that clear inequalities in readmission risk exist by ethnicity, with Māori and Pacific children being readmitted at a higher rate than non-Māori non-Pacific children, and by deprivation, with more deprived children being readmitted faster.

Hospitalisations for housing related diseases were also clearly associated with a higher risk of readmission, consistent with poor housing quality driving repeated admissions.

We concluded that improving the housing of children admitted to hospital for a housing-related disease should be trialled to see if the risk of readmission (and the economic and social costs it brings) can be reduced.

Summer Studentship – Runner-Up

Bonnie White

Facebook as an online support group for Arthritis NZ – a mixed methods study

Supervised by Dr. Rebecca Grainger & Dr. Karen Day

Sponsored by Arthritis New Zealand

Arthritis is the single greatest cause of disability in many parts of the world, affecting between 13-28% of people, with the burden expected to increase with the aging of developed populations. Similar to other long-term conditions, specialist care usually focuses on medical management, with less attention on the psychological and functional impacts of arthritis. Many people therefore seek further information and support from other sources, which includes the internet. Arthritis NZ is the leading NGO providing support for people with arthritis in NZ and has a Facebook page for people with arthritis, which includes scheduled time for interactions between Arthritis Educators and directly between people with arthritis. This page may be a valuable source of information about unmet health needs of people with arthritis. Therefore an analysis of this page was undertaken, including description of its users and an analysis of the page content.

Users of the Arthritis NZ Facebook page were predominately female and aged between 18-54 years. The page was mostly used for seeking or giving support, sharing information, or asking for advice. Unfortunately, there was limited interaction directly between people with arthritis but the page still provided a forum for informational and emotional support for users. This forum could be enhanced by encouraging user participation and training the page facilitators in engaging users and enabling online discussion. Further research should focus on barriers to user participation in online support groups

Summer Studentship – Runner-Up

Dhenisha Dahya

Clinical outcomes of cervical cancer patients treated radically with high-dose-rate brachytherapy at the Wellington Blood and Cancer Centre

Supervised by Dr. Carol Johnson

Sponsored by Cancer Society of New Zealand (Wellington Division)

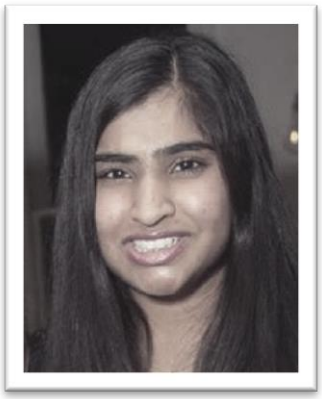
Cancer of the cervix accounts for approximately 1.7% of all female cancer registrations in New Zealand. Treatment for this type of cancer usually involves a specialised radiation treatment called brachytherapy. Brachytherapy is advantageous because the radiation does not need to pass through the body from the outside which means more dose can be delivered to the tumour and less to the surrounding tissues. The Wellington Blood and Cancer Centre have treated 105 cervical cancer patients with brachytherapy since 2011.

The aim of this study was to determine how effective the treatment was in controlling the disease and what the long term side effects were.

We found that treatment was able to control the disease in 85% of patients. A radiation dose of >70Gy and a histology of adenocarcinoma were significant factors for disease control. 68% of patients were still alive when this study was done. Of those that passed away, 5% deaths were not cancer related. There were only seventeen episodes of severe long-term side effects.

We compared these results with other hospitals that deliver similar treatments and found our results to be comparable.

Megna Jeram



Is the Epworth Sleepiness Scale© relevant for current New Zealand lifestyle practices?

Supervised by Dr Angela Campbell
& Associate Professor Alister Neill

Sponsored by The University of Otago Research Committee

The Epworth sleepiness scale (ESS) is a short questionnaire to measure levels of daytime sleepiness in adults. NZ research shows that the score can change significantly when subjects are asked to complete it on different days meaning the usefulness of the score is reduced.

To test if the ESS is current for today's lifestyles we talked to 24 patients referred for sleep testing. During the interview patients were asked about levels of daytime sleepiness, what times and situations made them feel sleepy and their understanding of the current ESS questions. Analysis was done by grouping similar situations where people felt sleepy and creating themes. The main sleep themes patients talked about included times of relaxation, during dangerous situations, feelings of tiredness/fatigue, and the need to nap. Patients had trouble understanding and relating to some of the questions in the current ESS. Following the interviews we developed suggestions to be included in a new sleepiness questionnaire.

The current ESS works generally well to describe daytime sleepiness in NZ patients presenting to sleep clinics. However a new sleep questionnaire developed to improve understanding and match with more common scenarios as discussed by patients would be useful.

Nicholas Jones

Epilepsy teaching within the New Zealand undergraduate medical curriculum *&* Epilepsy Research in New Zealand over the last decade

Supervised by Associate Professor Lynette Sadleir

Sponsored by New Zealand League Against Epilepsy (NZLAE)

The NZLAE funded a project to investigate epilepsy teaching within the undergraduate medical curriculum in New Zealand and identify New Zealand based researchers publishing on epilepsy over the last decade.

We requested all teaching resources relevant to epilepsy from New Zealand medical schools and analysed this for the depth of coverage of epilepsy topics and time allocated to epilepsy teaching. We found considerable variation in the breadth of epilepsy topics discussed, the depth of coverage of these topics and the time allocated to epilepsy teaching between medical schools. The NZLAE could develop a minimum core epilepsy curriculum amongst epilepsy educators to ensure all new graduates are appropriatley prepared to manage patients with epilepsy and raise the profile of epilepsy amongst undergraduate medical students. To this end a survey has been developed based on current teaching for epilepsy speciaists and generalists to indicate what they view as core epilepsy curriculum.

We also conducted a literature review of all publications relating to epilepsy or seizures published by New Zealand based institutions since 2006. From our audit we found 57 New Zealand based researchers who were first or senior authors on publications relevant to epilepsy or seizures over the last 10 years. By facilitating colloboration between these researchers, the NZLAE could enhance epilepsy research output from New Zealand and improve the profile of epilepsy.

Christopher Clews

The Contribution of Smoking to Inequalities in Mortality in New Zealand

Supervised by Andrea McDonald
& George Disney

Sponsored by BODE3, Dept of Public Health, UOW

Smoking prevalence is strongly patterned by both socioeconomic status and ethnicity, and is well documented as a major driver of mortality. Current evidence suggests smoking makes an important contribution to socioeconomic and ethnic inequality in mortality in New Zealand. This literature review outlines the current evidence on the contribution of cigarette smoking to socioeconomic and ethnic inequalities. A literature search was conducted and results screened to identify all papers which quantify smoking-attributable disparities in mortality. In total, 41 papers were processed for the main analysis. The most recent New Zealand publications place the contribution of smoking to socioeconomic inequality in mortality at 21% in men and 11% in women. Corresponding figures for ethnic inequality in mortality suggest a contribution of approximately 10%. However, a key conclusion of this review is that the smoking contribution varies considerably across countries, within populations, over time and by method of measurement.

In particular, depending on the approach to inequality measurement, considerably different conclusions may be reached. This highlights the need for ongoing monitoring of trends in smokingattributable inequality over time, and for complete reporting of all aspects of inequality. Methods used in New Zealand are comparable to those seen internationally, however all approaches have their own strengths and weaknesses which must be considered alongside the larger social context.

Thomas McHugh

Oral health of Tairāwhiti 5-year-olds following the implementation of "Good Oral Health for All, for Life"

Supervised by Associate Professor Lyndie Foster Page
Associate Professor Sue Pullon, Mr Arish Naresh
Dr. Patrick McHugh & Dr. Bruce Duncan

Sponsored by University of Otago & Tairawhiti Complementary & Traditional Therapies Research Trust, Hauora Tairawhiti

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The aim of this study was to determine whether the policy "Good Oral Health for All, for Life" had any effect in changing the oral health status of the children living in Tairāwhiti, and more specifically whether there was a change in the ethnic and deprivation inequality gaps. To do this, oral health data was collected for all five-year-olds living within Tairāwhiti for two separate years. The first set of data being before the implementation of the policy "Good Oral Health for All, for Life", and the second being after. Once data was collected, analysis was done using the programme SPSS to compare the two cohorts and start drawing conclusions about what, if any, effects that the policy may have had. Results suggested the policy might have improved oral health outcomes for Tairāwhiti 5-year-olds however the ethnic inequality gap did not improve following the policy's implementation.

Rosalind Poulgrain

Evaluation of prior Cardiovascular Risk Assessment in patients presenting with their first diagnosis of Acute Coronary Syndrome

Supervised by Associate Professor Stewart Mann
& Dr. Merrin Rutherford

Sponsored by Capital Cardiovascular Research Trust
& University of Otago, Wellington

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in New Zealand (NZ), accounting for 40% of all deaths, with Māori, Pacific Island and Indo-Asian populations experiencing greater CVD morbidity and mortality. To combat these inequalities in cardiovascular health, NZ, like other countries, has implemented a programme to assess cardiovascular health – 'Cardiovascular Disease Risk Assessment' (CVDRA). The estimated absolute risk can be used to guide interventions.

This study aimed to qualitatively evaluate CVDRA in patients with a first time diagnosis of Acute Coronary Syndrome (ACS) through the identification key themes relevant to the overall effectiveness of CVDRA.

Semi structured qualitative interviews were conducted with purposefully selected ACS patients receiving treatment on the cardiology wards of Wellington Regional Hospital. Interviews were digitally recorded, transcribed verbatim and analysed using grounded theory and thematic coding to identify key themes.

Six themes were identified: factors (motivators or barriers) influencing attendance of CVDRA and the uptake of subsequent recommendations; the importance of understanding the implications of the estimated cardiovascular risk; the relevance of the doctor-patient relationship and the necessity of effective discussion regarding CVDRA outcomes. A further widespread theme was the underestimation of personal risk of CVD.

These findings indicate the need to implement measures to improve the overall effectiveness of CVDRA. Identified motivators and barriers can be used to improve CVDRA attendance and the uptake of interventions. Strengthening the doctor-patient relationship allowing for discussion regarding personal risk and the implications of risk scores offers potential for improving CVDRA effectiveness.

Prashant Lakshman

Research database development in Department of Surgery and Anaesthesia

Supervised by Associate Professor Peter Larsen
& Dr. Scott Harding

Sponsored by Department of Surgery and Anaesthesia, UOW

Hospitals are continuously creating files for newly admitted patients, obtaining files for transfer patients and that data is then being used for research purposes. One of the key research predicaments is unreliable information or errors in the results of the data analysed.

Filemaker is a software programme that allows for the creation of databases. We used this programme to create an online version of our currently existing paper-based forms. During the process we re-evaluated the forms and made amendments that would improve the quality of data for the study and process.

To limit error in data entry certain fields had a value range functions placed, e.g. some fields could not be left empty while others required only a particular format of information to be entered. These were safe-proof measures to ensure reliability of data.

The databases are stored on an online server that can be accessed by any device that has Filemaker loaded onto it. IPads are used on the wards to enter patient information which is immediately saved onto the server thus avoiding loss of information if the device were to crash. This allows for real-time entry preventing error in memory recall or errors made in transfer of information. A major time-saving function is the export of the information into an excel file with a press of a button.

In addition a Tissue Bank database has been created which will lead to storage of information in one area that can be utilised for future research.

Fiona Chan

Predicting Risk of Rehospitalisation after Hip Fracture in Older Adults

Supervised by Dr. William Levack
& Professor Mark Weatherall

Sponsored by New Zealand Society for Geriatric Medicine

Hip fractures are a potentially devastating injury for older adults in New Zealand. With the ageing population this issue will increase as well as the cost to our health care system. Rehospitalisation of patients after hip fracture treatment contributes to this growing burden.

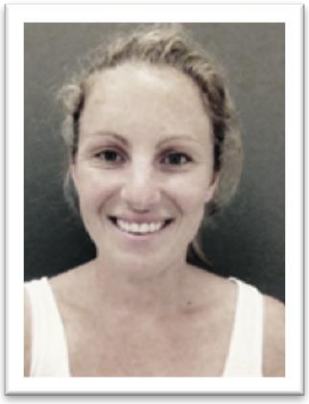
The aim of this study was to determine the readmission rate within one year following hospitalisation for a hip fracture. We also examined predictor variables that could potentially influence the readmission or death of hip fracture patients. These included patient related factors such as age, sex, and residence prior and post admission. We also investigated the association between the death or readmission and organisational factors such as length of stay of the initial admission, whether patients received rehabilitation, time to surgery, number of discharge medications, surgery type, and fracture type.

Using the hospital database, we conducted an audit of 388 older adults over 50 years who were admitted with hip fracture to Wellington hospital over a two year period – January 2012 to December 2013.

We found that 31% of older adults admitted to hospital with hip fracture readmitted within one year and 27% died within one year. There was a weak association between both a longer time to surgery and number of discharge medications increasing the likelihood of death or readmission. Rehabilitation unit admissions, having a total hip joint replacement, and being discharged to a private home were weakly associated with not having a readmission or dying within a year.

Hip fractures in the older population continue to have a high readmission rate as well as a high mortality rate within a year post discharge, and this study points to some potentially important factors that are worth further consideration.

Sophie Wilkinson



Seizures in newborn asphyxia - should we treat them and if so, how... What can we learn from the literature and our colleagues here and overseas?

Supervised by Dr. Thorsten Stanley

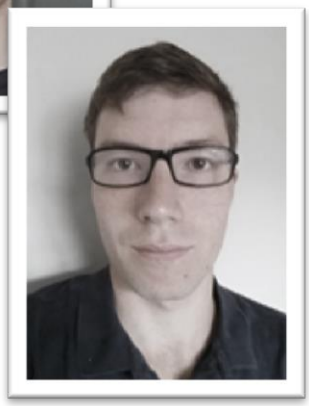
Sponsored by Department of Paediatrics, UOW

The lifetime risk of seizures is highest in the first week of life. The most common cause of these seizures is a lack of circulation and oxygenation around the time of birth which can lead to brain damage, termed HIE (hypoxic ischaemic encephalopathy). As many as 60% of the neonates who suffer HIE go on to develop seizures, including most of the more severely affected infants. Neurodevelopmental delay can ensue long-term but it is unclear whether the actual seizures cause further insult to the neonatal brain or if outcomes are solely attributable to damage from HIE.
As a result it is debatable whether treatment of these often self-limiting seizures is indicated considering many AEDs (antiepileptic drugs) have been shown to potentially cause brain damage themselves, especially in newborns.

This study aimed to assess current AED treatment protocols for HIE-related seizures in NICUs (neonatal intensive care units) around the world and to look at what evidence exists in the literature regarding AED use in this subset of neonatal seizures. A survey was sent to 148 NICUs worldwide with a response rate of 45%. Results found only 18% of NICUs had a specific HIE-related AED seizure protocol. Amongst all NICUs, Phenobarbitone was the most commonly used first-line drug, with Phenytoin, Levetiracetam and Midazolam used second-line but often with great variation in dosages being used. This reflects the limited evidence in the literature around AED treatment of HIE-related neonatal seizures. Of the above drugs, only Levetiracetam has not been reported to cause potential damage to the newborn brain.

Together these findings indicate an urgent need for further research to determine the place of AEDs in HIE-related neonatal seizures and if they are indicated, a safe, evidence-based protocol.

Jordan Felderhof & Jonathan Wood



Investigating student engagement with 3D rotational pathology specimens www.pathmuseum.otago.ac.nz

Supervised by Dr. Diane Kenwright

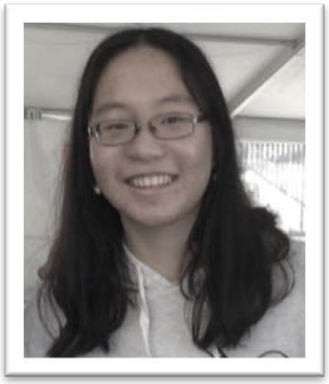
Sponsored by CALT Award; Dept. Pathology HOD Research Fund

With an increasing focus on e-learning methods to facilitate student learning, the University of Otago Wellington Pathology department decided that a new website be constructed to display 360° rotational digital renderings of the museum specimens, providing a new resource to complement the present physical museum. The purpose of this research is to construct a pathology website that allows students to interact with specimens; conduct website usability testing, and compare the user experience for physical specimens and e-specimens.

Initial stages involved photographing of museum pot specimens, and turning the images into an interactive tool displayed on a new pathology website. Following the website's creation, a group of administration staff and medical students were invited to participate in a focus group where an evaluation; assessing website usability, student engagement with the website, and comparison between physical and digital specimens, was completed.

360° rotational specimens are a novel way to enhance the user experience and allow more interactivity and information to be accessed about a specimen compared to static photographs. They are equal in acceptability to users compared to real speciemns when used as a teaching tool. We were able to effectively photograph pathology specimens and construct a website using minimal equipment and resources, developing a specific methodology that is novel and has not been descibe before in the literature. We concluded from this research that the new pathology website resource serves as a useful e-learning tool, but has several areas in which we propose future improvements and developments are to be made.

Gisela Kristono



Fel d I Allergen and Endotoxin in Electrostatic Cloths and Bedroom Dust

Supervised by Professor Julian Crane
Associate Professor Rob Siebers
& Dr. Caroline Shorter

Sponsored by Wellington Asthma Research Group

Endotoxin, a component found in bacterial cell walls, and cat (Fel d I) allergen are factors associated with asthma symptoms. They are inhaled from the air and samples can be collected from vacuumed dust or by air sampling to determine the levels found in a person's house. The electrostatic dust collector (EDC) is a relatively new method for collecting these samples, where two electrostatic cloths are placed on a plastic shelf and left to collect dust for a period of time. Other studies have found EDC to be more comparable to air sampling than floor dust sampling.

In this study we compared the levels of cat allergen and endotoxin found from EDC samples with bedroom floor dust and mattress dust samples. We investigated whether there was a correlation between the allergen and endotoxin levels in the bedrooms of 30 wheezing and 30 non-wheezing children, and whether there was an association between allergen and endotoxin levels and home environmental factors.

Our results showed that:

1. Endotoxin levels from EDC samples were quite different to levels in dust samples, but cat allergen levels in the three sampling methods were all correlated.
2. Higher endotoxin levels may be protective against wheezing, but we found no relationship between cat allergen and wheezing.
3. Cat ownership was the main factor associated with higher cat allergen levels, while home occupancy, pet ownership, bedroom humidity, bedroom temperature and mould affected endotoxin levels.

Hamish Louis

Management of Idiopathic Toe-Walking in New Zealand

Supervised by Dr. Koen De Ridder

Sponsored by The Surgical Research Trust

The current scientific literature regarding the natural history and efficacy of management of idiopathic toe-walking (ITW) is conflicted and of poor quality - the majority of previous studies have fundamental flaws, have featured small sample sizes, and are highly susceptible to selection and information biases. In the midst of this environment of poor scientific evidence, we aimed to elicit whether orthopaedic surgeons in New Zealand regardless treat this condition with consistency and confidence. We secondarily aimed to evaluate the management of ITW by other professions that either act as gateways to orthopaedic surgeons, or who manage less severe cases. These professions were general practitioners, paediatricians, podiatrists and physiotherapists

Our questionnaires found an inconsistency and a lack of consensus in the management of ITW by orthopaedic surgeons in New Zealand – choice of treatment varied between surgeons. We were also able to elicit a general unease felt by all professionals managing this condition, with the majority of responders answering 'no', or 'do not know' to the questions regarding their confidence in their management of this condition. Comments similarly left by many responders showed contrasting views in regard to the condition's natural history and management inter- and intra-professionally.

In response to these findings, we believe further research is indicated to assist professionals in making better informed, and more confident choices in the management of patients with ITW.

Leah Boyle

Smartphone Apps for Self-Management of Diabetes

Supervised by Associate Professor Jeremy Krebs & Dr. Rosemary Hall

Sponsored by Diabetes Wellington

The incidence of diabetes is increasing in New Zealand, with particularly high rates amongst Maori and Pacific adults. MHealth (mobile health) technology, especially smartphone applications (apps) for diabetes provides a new way to help with diabetes self-management, however most apps are associated with a number of safety problems.

The aim was to establish whether people with diabetes in Wellington are using smartphone apps to assist with diabetes management, which app features are useful, and which features would be desirable.

We conducted a cross-sectional online survey of the 539 patients seen at Capital and Coast secondary care diabetes clinics in the last twelve months to assess this. We extracted participants recent clinical results including HbA1c, lipids, blood pressure and medication lists from the hospital system.

Our survey showed that 20% of responders are using an app but 61% would be interested. Interestingly, app users were significantly younger on average that those without an app and were more likely to have type 1 diabetes. The most favoured feature in current apps was diary of blood glucose levels. The most desirable feature was a calculation device to determine insulin dose in app users and a blood sugar diary in non-app users

Given interest in diabetes apps, but with knowledge of their problems, these survey results will be used to guide the development of a future safe app for diabetes self-management.

Sarah Wheeler

Diabetes in pregnancy outcomes over 22 years

Supervised by Dr. Rosemary Hall
& Associate Professor Jeremy Krebs

Sponsored by CENOR & University of Otago Research Committee

Diabetes in pregnancy has been linked to adverse outcomes for both mother and infant, including being large-for-dates. The purpose of the study was to investigate trends in presentation and outcomes for diabetic pregnancies over a 22 year period.

Data came from clinical records from the Wellington Hospital diabetes in pregnancy clinic from 1981 to 2002, from women with either pre-existing diabetes or gestational diabetes. Detailed information was gathered about the mother and her pregnancy, diabetes, the birth and the health of the baby at birth. These data were entered into a second database and carefully checked for accuracy before analysis.

There were 1106 pregnancies from 893 women in the data. The population consisted of 46.1% European, 9.4% Māori, 23.4% Pacific Islander, 8.4% Indian, 10.6% South East Asian and 2.1% Other. At conception, 60% had no diabetic diagnosis, 16.9% had previously had a diagnosis of gestational diabetes, 13.7% had a diagnosis of Type 1 diabetes, 8.3% had a diagnosis of Type 2 diabetes, and 1.1% had a diagnosis of glucose intolerance (where glucose control is not normal but patients do not yet have diabetes).

The birthweight of the babies was 12.4% higher than average. Birth weight did not seem to be affected by either pre-pregnancy weight or glucose control at the start of pregnancy. The baby's health at birth did not seem to be determined by which type of diabetes women had when they became pregnant.

In future research, these data can be compared to present and future data to explore changes in presentation, and follow up children and grandchildren, to investigate the effect of maternal and pregnancy factors on their diabetes and obesity risk.

Olivia Badcock

Variation in the incidence of branded Ventolin dispensing for asthma by socioeconomic

Supervised by Dr. John Wyeth
& Dr. Scott Metcalfe

Sponsored by PHARMAC

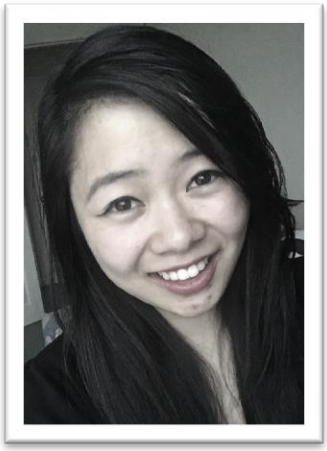
PHARMAC (New Zealand's medication funding authority) currently funds three different brands of salbutamol aerosol inhaler for asthma symptom relief: Respigen, Salamol and Ventolin. Respigen and Salamol are fully-funded while Ventolin is partially-funded. Patients who are prescribed Ventolin are required pay an additional charge of ~$4.00 per inhaler. Despite this increase in cost to the patient, Ventolin remains the preferred salbutamol inhaler in New Zealand.

This study aimed to examine any preferences for Ventolin dispensing at the prescriber or the pharmacy levels, determine whether there is any difference in Ventolin dispensing rates by socioeconomic deprivation and better understand what the possible driving influences for Ventolin dispensing are.

This study was conducted in three parts: an analysis of pharmacy claim data, a comparison of the way salbutamol prescriptions are handled at both the pharmacy and prescriber levels, and a survey of prescribers' and pharmacists' opinions on generic salbutamol (Salamol and Respigen). We found rates of Ventolin dispensing varied greatly between different prescribers and different pharmacists. There were high rates of Ventolin dispensing in New Zealand, at all levels of socioeconomic deprivation, implying a loss of cost savings in a group of people who may be the most financially affected.

Pharmacists' and prescribers' opinions on generic salbutamol also varied greatly. Their influence on Ventolin dispensing rates and on patients' perception of generic medication is important and could potentially be the key to increasing the use of generic salbutamol in New Zealand.

Cindy Cheakhun



Do Guinea Pigs Develop Gestational Diabetes?

Supervised by Associate Professor Jeremy Krebs
Dr. Max Berry & Dr. Rosemary Hall

Sponsored by Associate Professor Jeremy Krebs

Metabolic disorders like diabetes and their associated problems are an ever-increasing issue. Many factors contribute to development of these disorders, one being the environment surrounding the foetus before birth. Gestational diabetes (GDM) is a state of high maternal blood sugar levels in late gestation resulting from a relatively inadequate insulin response to increased requirement. High maternal blood glucose levels can directly affect the unborn baby by passing through the placenta, altering foetal growth and postnatal glucose tolerance. To define the effects of maternal GDM on infant outcomes we sought to develop an animal model of GDM using guinea pigs, a species with similar gestational physiology to humans.

Fifteen pregnant guinea pigs from the University of Otago colony were studied. 8 received control diet, 7 an obesogenic diet. Oral glucose tolerance tests (OGTTs) were performed on day 1, 30 and 65 following mating to determine changes in glucose handling throughout pregnancy. 3 control animals had a full set of OGTTs whereas 4 obese animals have reached mid-gestation. The remaining OGTTs will be done once appropriate gestational age is reached. Two obese animals had unexpected pregnancy loss after day 30; a complication that is unlikely related to either diet or OGTT.

Glucose clearance in mid gestation, in all animals, is more effective than in early gestation. Preliminary data in control animals suggest that late gestation glucose tolerance is similar, or better, than in mid-gestation. In control animals this mirrors the physiology of human pregnancy. The late gestation glucose tolerance of obese guinea pigs remains to be determined.

Jong Shin

Prevalence of Type 2 Diabetes in New Zealand Children

Supervised by Dr. Bryan Betty

Sponsored by PHARMAC (Pharmaceutical Management Agency)

Diabetes Mellitus is a global health problem that also impacts New Zealand greatly. With T2DM (Type 2 Diabetes Mellitus) disproportionately effecting people of Māori and Pacific descent, the number of diabetics in New Zealand is only expected to increase in the future. An emerging problem is the increasing number of children (<19 years old) now being diagnosed with T2DM, which is likely to have profoundly adverse effects in these individuals in the future, with its complications ultimately proving fatal. As anticipated, the burden on the health care system may also be substantial.

This nationwide study highlights a profound overrepresentation by Māori and Pacific children in the population of New Zealand children with T2DM. It also shows that Indian, Pacific, and Māori populations have a higher risk of developing diabetes compared to New Zealand Europeans in adulthood, especially between the ages of 40-60.

Niamh Hammond

Recent onset transient or episodic headaches with concerning features

Supervised by Dr. Anna Ranta

Sponsored by Neurological Foundation of New Zealand

Episodic headaches are a widely experienced complaint. While the majority are due to benign processes, some headaches can herald serious and life-threatening diseases. One such cause is a type of brain bleed known as a subarachnoid haemorrhage (SAH) that can present initially as a 'sentinel bleed'. This retrospective audit aimed to investigate the proportion of patients presenting with transient/episodic headache and concerning features that are later confirmed to have these serious brain bleeds. Six months of head CT data were analysed from Wellington Hospital and Palmerston North general practice referrals in 2015 for acute brain abnormalities (such as stroke, haemorrhage or brain tumour). Of the 2,218 CT referrals one third were for headache. 177 qualified as transient/episodic and none of these patients had a SAH. This is reassuring in addressing the concern of sentinel bleeds. However, 7.9% of the 177 did have some significant brain abnormality on imaging, meaning that a transient/episodic headache is not completely reassuring, particularly when accompanied by focal neurological signs or symptoms. Patients with focal neurology in addition to a transient/episodic headache were found to be 3.6 times as likely to have an acute brain abnormality. Patients who did have subarachnoid haemorrhage demonstrated a similar cluster of symptoms to existing literature, such as thunderclap headache, vomiting and loss of consciousness. This study suggests that patients with transient/episodic headache are at low risk for SAH, however, those presenting with focal neurologic features may still benefit from brain imaging to exclude other serious pathology.

Mary Furniss

Psychosocial Screening and Support offered to Women who have suffered a Severe Maternal Morbid Event

Supervised by Dr. Sara Filoche
& Dr Jane MacDonald

Sponsored by Wellington Faculty of the Royal New Zealand College of General Practitioners

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There is a group of mothers who become very ill during pregnancy, childbirth or just after childbirth and narrowly escape losing their life. This is termed severe maternal morbidity (SMM). These mothers are at increased risk of developing mental health problems (including postpartum depression) and may need additional social support. Little is known about this support, and about the referral patterns and services offered while these women are inpatients. This study looked at women who suffered a SMM event and whether they were offered mental health and social support, and clinical follow-up on discharge from hospital. It also looked at whether these women had any indication of need for this support (previous mental health problems, substance abuse, domestic violence and other life stressors). In order to gather this information, hospital notes from 257 women who had a SMM event were reviewed. Results indicated that 60% had some indication of need support but only 40% of women received it during their admission. In conclusion, many SMM women did not receive the psychosocial support that might be expected as best practice after such a traumatic delivery. Evidence is strong that referral to mental health or allied services, event debrief, full discharge letter and specialist follow up is necessary in order to facilitate recovery. Findings from this study add to a growing body of SMM research indicating that improvement is needed for the whole package of care offered to women who suffer a SMM event.

Julia Turnbull

Outcomes following (chemo) radiotherapy for oropharyngeal cancer

Supervised by Dr. Jamie Evans
& Dr. David Hamilton

Sponsored by Cancer Society of New Zealand (Wellington Division)

The incidence of oropharyngeal squamous cell cancer has been increasing in New Zealand, most noticeably since about 2005. (Chemo) radiotherapy is currently the mainstay of treatment for such carcinomas. The Wellington Blood and Cancer Centre (WBCC) previously utilised three-dimensional conformal radiotherapy (3D-CRT) as its radiation treatment technique. In May 2012, the centre then switched from 3D-CRT to a more advanced treatment technique of volumetric modulated arc therapy (VMAT) for the planning and treatment of patients with oropharyngeal squamous cell cancer.

The purpose of this project was to investigate the outcomes of local control, survival and early and late toxicity in patients with oropharyngeal squamous cell carcinoma treated with (chemo) radiotherapy at the WBCC since the implementation of VMAT. We analysed both the prospectively and retrospectively collected data of 43 patients treated with VMAT.

Overall 2 year survival of 88% was comparable to that in similar studies. When comparing our results for acute toxicity to the existing literature, we found a lower percentage of patients with ≥ Grade 3 toxicity overall. This early data is reassuring that VMAT radiotherapy has tolerable toxicity and acceptable local control and survival.

Kyriakos Matsis

Demographics and clinical features of premature myocardial infarction patients in New Zealand

Supervised by Associate Professor Peter Larsen
Dr. Scott Harding & Ana Holley

Sponsored by The Surgical Research Trust & Phil and Ted

Cardiovascular disease is the leading cause of death in New Zealand, with death by myocardial infarction (MI), or "Heart attack", occurring every 90 minutes. Although thought of as a disease of the older members of our society, a smaller but significant proportion of heart attacks occur in younger people. The burden of heart attacks in a younger population can be considered significant as they are more likely to be supporting young families, and may represent more life years lost due to disease. Previous international studies have described the demographic and risk factor profiles of premature heart attack patients, but to the best of our knowledge, this has never been done in a New Zealand population. Therefore the purpose of this study was to assess the rate and clinical profile of young adults presenting with a heart attack in New Zealand.

We found that compared to the older heart attack patients, premature heart attack patients were more likely to be male (80% vs 71%), have a higher BMI (31 kg/m2 vs 29 kg/m2), with a higher proportion of Maori and Pacific Island ethnicities (21% vs 10%), more likely to have a family history of heart attacks(49% vs 34%) and more likely to be current smokers (47% vs 20%). Premature heart attack patients were less likely to have high blood pressure, cholesterol problems, or diabetes than the older heart attack patient population.

This information is important for the purpose of identification and risk factor modification and could ultimately affect prevention strategies.

Annie Noakes

Physiological Determinants of Cerebral Oxygenation Stability

Supervised by Associate Professor Shieak Tzeng

Sponsored by National Heart Foundation

The brain is one of the body's most metabolically active organs. Cerebral autoregulation is a mechanism by which the brain ensures stable blood flow to provide sufficient oxygen to cerebral tissue. In cerebrovascular disease such as stroke, this mechanism may be compromised which can have detrimental effects.

In this study, we investigated the relationships between blood pressure, cerebral blood flow and cerebral oxygenation, in order to evaluate the role of the myogenic component of cerebral autoregulation. To blunt the myogenic response, usually responsible for calcium-dependent smooth muscle action of the cerebral vasculature, we gave participants a calcium channel blocker. The results of this session were compared to an identical session with a placebo in place of the blockade. Through the use of linear transfer function analysis as well as multivariate wavelet analysis, we were able to observe the relationship between these haemodynamic variables.

Results showed marked differences between the placebo and calcium channel blockade groups particularly in the wavelet analysis, and indicated that in the 0.12-0.17 Hz frequency band, myogenic activity and the control of cerebral oxygenation was present. We were also able to highlight the limitations of transfer function analysis, as these results were not seen in this analysis due to the arbitrarily defined frequency bands.

In the clinical context, this study shows that blood pressure targets may not necessarily translate to optimal cerebral blood flow or oxygenation at the tissue level unless cerebral autoregulation is taken into account. In order to achieve more targeted cerebrovascular treatment, future research needs to integrate blood pressure measurements with direct measures of cerebral blood flow, tissue oxygenation, and cerebral autoregulation.

Nicole Gledhill

Follow-up of preterm infants in New Zealand

Supervised by Dr. Nathalie de Vries
Gabrielle Scott & Dr. Claire Hardie

Sponsored by Mid-Central District Health Board

Babies born at less than 37 weeks gestation are termed preterm infants. These preterms are at risk of abnormal growth and development. Multidisciplinary follow-up of these high-risk infants can be beneficial for the individual infant and families through early identification and intervention for problems of health and development. There is no national guideline in New Zealand (NZ) regarding clinical follow-up of preterms.

This study is a review of the existing follow up of preterms in NZ, and how it is organised by different organisations and District Health Boards (DHBs).

From November 2015 until January 2016, a questionnaire was sent out across NZ to one paediatrician from each hospital (n=24) and one Child Development Service (CDS) (n=20) from each DHB. All paediatricians responded and 85% of the CDS's. Responses were collated and compared to recommendations from paediatric literature and international guidelines .

The results found tremendous variation across NZ for the eligibility criteria for routine preterm follow-up. Overall a gestational age < 32 weeks and/or birth weight < 1500 gram was the general consensus across NZ. The timing of visits and the assessments that are performed also varied enormously.
Paediatric literature recommends a minimum standard for preterm follow-up.

A standardised follow-up of preterm infants across NZ would be the ideal situation. Due to the lack of funding and resources a standardised follow-up is not possible at the moment. However, this research does highlight the need for discussion around this topic by the NZ Paediatric Society.

Kavindu Weerasekera

Epidemiology of eosinophilic oesophagitis in the Wellington region

Supervised by Dr. Stephen Inns

Sponsored by Department of Medicine, UOW

Eosinophilic oesophagitis (EoE) is an immune-mediated inflammatory condition of the oesophagus which causes difficulty with swallowing. Over time, EoE can cause the oesophagus to narrow, which can result in a food bolus becoming stuck within the oesophagus, requiring endoscopic removal. As a result, EoE is colloquially referred to as 'asthma of the oesophagus'.

Recent literature has shown an increasing incidence of the disease; however no epidemiological data existed regarding New Zealand rates of EoE. The disease is associated with atopy and New Zealand's high rate of atopic disease means the disease is likely to be important in our population.

We made a search of all the laboratory and endoscopic databases in the Wellington region to identify all diagnosed cases of EoE in the last 5 years. Case notes were examined to determine key demographic and clinical parameters and annual incidence rates were calculated.

We found 91 cases of EoE in the Wellington region with an average annual incidence of 4.15 per 100,000 persons. This meant that it was no longer considered a rare disease. Interestingly, we found no evidence of a significant difference in incidence rates by year in our study population and this was in stark comparison to many previously published studies that described increasing incidence rates. This was a significant finding in that it meant that these recent trends may have been due to an increased awareness of the disease and that the cases of the disease may have reached a stable incidence in New Zealand.

Anita Jacob

Regulation of cerebral perfusion in childhood

Supervised by Dr. Max Berry
& Associate Professor Shieak Tzeng

Sponsored by Cure Kids

Children and adults who were born very preterm are at increased risk of poor long-term health outcomes, including cerebrovascular disease and high blood pressure, compared to those who were born at term. Cerebral autoregulation, a process which ensures that brain blood flow remains constant despite changes in blood pressure, could possibly be impaired in those born preterm. This may explain the link between preterm birth and later cerebrovascular disease.

To test this hypothesis we recruited 20 ex-preterm (10 males, 10 females; ≤34 weeks gestation) and 20 ex-term (10 males, 10 females; ≥37 weeks gestation) who were aged 5-10 years old. We took recordings in the supine (lying down), tilted, sitting and standing positions to see how brain blood flow changes when blood pressure changes. Recordings included the middle cerebral artery velocity, electrocardiogram, nasal partial pressures of oxygen and carbon dioxide and blood pressure. Only data acquired while the children were in the supine position are reported in this studentship.

Brain blood flow regulation was assessed using linear transfer function analysis, which produces values that measure the effectiveness of cerebral autoregulation. One of these values is called phase which measures the timing difference between blood pressure and brain blood flow oscillations. The bigger the phase, the better the cerebral autoregulation.

The main finding in this study was that ex-preterm females showed a higher phase at Low Frequency (0.04-0.15Hz) range. While this is the first demonstration of a long-term alteration in the way brain blood flow is regulated in the ex-preterm, the underlying mechanisms and clinical consequences remain to be determined.

Mei Chen

Study into quality control and imaging test objects for spectral micro CT

Supervised by Dr. Nanette Schleich
Dr Aamir Raja & Associate Professor Anthony Butler

Sponsored by Maurice & Phyllis Paykel Trust

In the last decade, our New Zealand based research team has been working on the development of a spectral computed tomography (CT) scanner called the 'Medipix All Resolution System' (MARS). In comparison to conventional CT scanners, MARS CT utilises energy resolved photon counting detectors. This represents an advance analogous to changing from black-and-white to colour vision.

Throughout the scanner development, imaging test objects ('phantoms') were built and scanned to assess scanner functionality. Nevertheless, a MARS specific, comprehensive and well documented quality control (QC) system had yet to be developed. This project has focussed on providing the MARS team with a workable imaging QC system for internal use, i.e. for both scanner development and preclinical research. We have assessed existing phantoms and protocols that had previously been developed by the MARS team. Some of the phantoms and procedures were redesigned and modified, with the aim of creating tests that are reproducible whilst being adequately sensitive to changes in the parameters to be tested. Series of repeat measurements were taken to create baselines and to test for constancy.

Based on the measurements collected, we have established that the scanning process is stable, and that the scanning and data reconstruction chain provide results with satisfactory constancy. Nevertheless, some of the results indicate that the current scanner configuration may produce less reliable parameters to perform material decomposition analysis, warranting a closer investigation of the imaging chain. In the scientific report, we assess potential causes of some of the problems and suggest possible solutions.

Georgia Brownlee

Measuring indigenous health and wellbeing: a review of quantitative measures

Supervised by Dr. Donna Cormack
& Dr. Ricci Harris

Sponsored by Health Research Council of New Zealand

The World Health Organisation describes wellbeing as having two dimensions, subjective and objective, that comprise an individual's experience of their life as well as providing a comparison of life circumstances with social norms and values (WHO Europe, 2013). Traditionally, standard socioeconomic and objective health indicators have been the focus of research, government policy and evaluation. There has been less research, however, on differences between Indigenous and non-Indigenous in terms of subjective measures of wellbeing (Biddle, 2014). The aim of this summer studentship project is to undertake a review of the literature to identify measures that have been used in quantitative studies (e.g. surveys) to assess indigenous wellbeing, both within New Zealand and internationally.

Aspects of Indigenous wellbeing measured within this systematic review encompassed social and emotional wellbeing, life satisfaction, psychological wellbeing, physical wellbeing, relational wellbeing, cultural wellbeing and community wellbeing. The importance of these measures in providing a holistic view of the health and wellbeing of Indigenous populations rather than focusing upon a weakness-based objective view is obvious. However, often findings of Indigenous research surrounding subjective wellbeing are not comparable between non-Indigenous populations on a global scale. Therefore, more work may need to be done to identify standardised measurement tools that are able to adequately encompass the scope and uniqueness of Indigenous wellbeing while still retaining the ability for comparison.

Emma Woodhouse

Natural History and Recovery of the High Frequency Vestibular Ocular Reflex Gain in Vestibular Neuritis

Supervised by Dr. Stuart Mossman

Sponsored by Neurology Department, Capital and Coast DHB

Acute vertigo is a common clinical presentation that is sometimes diagnostically challenging. While often benign, it may represent serious pathology such as a stroke.

A common cause of acute vertigo is vestibular hypofunction. Assessment of vestibular function is achieved through semi circular canal stimulation and eye movement analysis. Traditionally this has been performed using bi-thermal caloric irrigation, which evaluates a canal paresis. Although widely used, caloric irrigation is time-consuming, can cause patient discomfort, and evaluates vestibular function at a frequency below the physiological range.

The video head impulse test (vHIT) overcomes these issues and has been shown to be of value in assessing vertigo. The vHIT is based on the clinical head impulse test (HIT). However, unlike the clinical HIT which is assessed qualitatively by the observer, the vHIT enables objective recording of the velocity of the horizontal vestibular ocular reflex (HVOR). The HVOR can be compared to head velocity at certain time intervals to obtain a VOR gain measurement, representing the ratio of eye to head velocity. Although previous studies have compared results of VOR gain to caloric stimulation acutely, serial changes occurring over longer periods of time have not been reported.

The aim of this study was to compare results of HVOR gain and canal paresis recovery in patients with unilateral vestibular neuritis over one year. We recruited 35 patients who presented to the emergency department with unilateral vestibular neuritis from 2011 to 2014. Serial measurements were performed over a one-year period to assess the natural history and recovery of HVOR gain and caloric paresis.

The results show that in patients with unilateral vestibular neuritis, HVOR gain recovers significantly faster than canal paresis.

The implications of this study are that although using the vHIT in an emergency setting is practical and useful for a rapid diagnosis of loss of vestibular function, a normal vHIT test result may not always exclude previous vestibular neuritis.