BACHELOR OF MEDICAL SCIENCE (HONOURS)

HONOURS PROJECTS AND SUPERVISORS 2019/2020

Flinders UNIVERSITY
College of Medicine
& Public Health

BMedSci Honours Project 2020

Welcome to the College of Medicine and Public Health

This booklet is a summary of projects on offer throughout the CoMPH that can be taken for enrolment into the BMedSci hons program in 2020. The projects reflect the diversity of our College and projects have been grouped into those related to Molecular and Cell Biology and those with a Public Health or Clinical Medicine focus.
For more information on the specific projects, contact the individual researcher listed for that project. For more information on the requirements for entry or the structure of the study program within the BMedSci hons course, contact the course Chairs; Professor Briony Forbes (briony.forbes@flinders.edu.au) or A/Professor Jill Carr (jill.carr@flinders.edu.au). Mid-year entry A/Professor Roybn Meech (robyn.meech@flinders.edu.au).

For further information on areas of research in the Flinders Cancer Centre go to https://www.flinders.edu.au/cancer

We hope you find an area of interest within our College and wish you success in your future studies.

Bioscience Honours Projects available in 2020

Project Subject Areas: Cancer Cell Signalling, Genetics and Cell Biology.

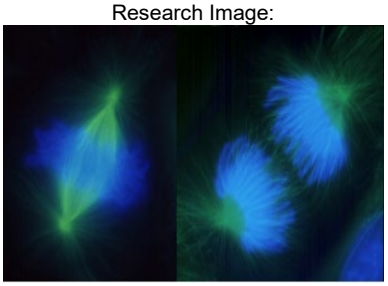
Supervisor's Photo:

Researcher's Name: **Janni Petersen**
Researcher's Email: Janni.Petersen@flinders.edu.au

Research Group Name: Environmental control of cell growth and division

Location of Project: Flinders Centre for Innovation in Cancer

Research Image:



Brief Outline of Project:

Title: Environmental control of cell growth and cell division: relevance to cancer

Cancer is a disease of inappropriate cell growth and cell division. Cancer cells migrate to colonize new parts of the body, here they undergo cell division in environments with limited nutrient supply and therefore cancer cells are frequently nutritionally stressed. The Target of Rapamycin (TOR) signaling pathway co-ordinates cell division with available nutrients and importantly altered TOR signaling has been linked to 80% of cancers. We exploit the simplicity of single celled organisms with strong genetics to understand the principles of TOR signaling and identify key conserved regulations of this pathway before we transpose rigorously tested predictions to human cells. In shedding light on the mechanisms behind environmental and TOR pathway control of cell division we aim to target this signaling pathway in human cancers.

The student will gain experience with a range of techniques including mammalian tissue cultures, cell biology and genetics, Biochemistry including: SDS-PAGE, western blotting immuno-precipitations, kinase assay's. Molecular biology including: PCR, DNA cloning and DNA sequencing. Immuno-fluorescence microscopy and live cell imaging**.**

Key References:

Davie, E , Forte G, and Petersen, J. Nitrogen regulates AMPK to control TORC1 signaling. **Current Biology.** 2015 16:445-454

Davie, E and Petersen, J. Environmental control of cell size at division. **Current Opinion in Cell Biology**. 2012 24:838–844

Petersen, J. and Nurse, P. TOR signaling regulates mitotic commitment through the stress MAP kinase pathway and the Polo and Cdc2 kinases. **Nature Cell Biology**. 9: 1263 – 1272. 2007

Link to more information about researcher or research group:
http://www.flinders.edu.au/people/janni.petersen

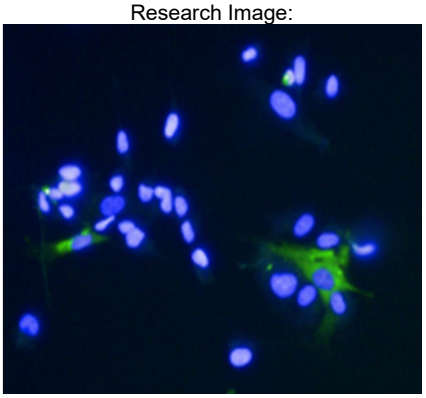
Project Subject Area(s): Studies of Viral replication and pathogenesis

Supervisor's Photo:

Researcher's Name: **Jill Carr**
Researcher's Email: jill.carr@flinders.edu.au

Research Group Name: Viral Research Laboratory
Location of Project: FMC, level 5

Research Image:



Brief Outline of Project:

The laboratory of A/Prof Carr undertakes a number of avenues of research into the study of viruses and how they interact with the host to cause disease including:

Dengue virus (DENV), the induction of endothelial cell permeability, including through mechansims such as induction of the complement alternative pathway and infection and induction of inflammatory responses in specific tissues such as the brain and the eye.

Zika virus (ZIKV), the ability of ZIKV to infect and cause inflammation in the eye

Enteric viruses, such as norovirus and adenovirus-F, the ability of infectious virus to survive in the environment with implications for infection control, and the induction of changes in cells of the gut following infection.

Models include *in vitro* cell culture and mouse infection models, with studies in the laboratory utilising molecular assays such as PCR and cell biology techniques such as immunofluorescent staining (see image) to analyse viral replication and host cell responses.

Specific details of a project will be based on the above but can be discussed with the candidate and will be influenced by goals identified for the laboratory towards the end of 2019

Link to more information about researcher or research group:

https://www.flinders.edu.au/people/jill.carr
http://www.flinders.edu.au/medicine/sites/microbiology/virology/research.cfm

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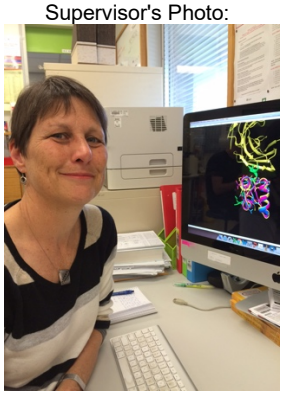
Project Subject Area(s):- Understanding Insulin Receptor Signalling Bias

Supervisor's Photo:



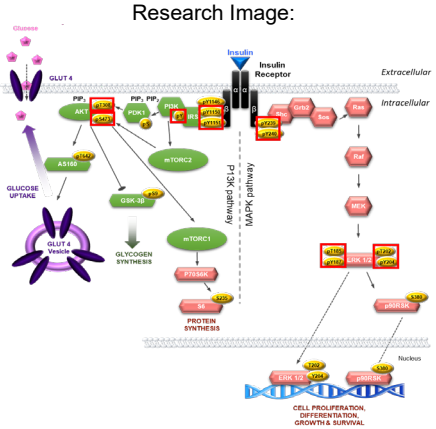
Researcher's Name: **Briony Forbes**

Researcher's Email: briony.forbes@flinders.edu.au

Research Group Name: Proteins in Metabolism and Cancer

Location of Project: Flinders Medical Centre, lab 6E109

Research Image:



Brief Outline of Project:

The Forbes lab aims to develop novel treatments for diabetes and cancer through understanding the basic mechanism by which insulin and insulin-like growth factors (IGFs) bind and activate their receptors (the insulin receptor and the IGF-1R) to promote cell growth, survival and metabolic control.

Surprisingly we still lack fundamental information as to how insulin and IGFs interact with their receptors to promote the key conformational changes required to activate the receptor tyrosine kinase domains and subsequent downstream signalling pathways. We will probe this interaction by making novel mutants of the ligands and the receptors and then testing these in cell-based assays for their abilities to promote downstream signalling.

Taking such an approach we have recently demonstrated that we can produce insulin analogues that preferentially turn on metabolic and not growth promoting actions. This is termed signalling bias. We now aim to understand the molecular basis of signalling bias This will allow us to understand in detail which interactions between the ligands and the receptors are key for promoting specific receptor activation outcomes. Ultimately this information will allow us to create novel IGF inhibitors for the treatment of cancers that are dependent on IGF signalling for growth and survival.

Link to more information about researcher or research group:

http://www.flinders.edu.au/neuroscience/lab_proteins.html

Relevant publications involving the Forbes lab:

Ahorukomeye P et al. *eLIFE* (2019) 8. pii: e41574

Ong S et al *J. Biol. Chem.* (2018) 293(30):11928-11943.

van Lierop B, Ong SC *Nat Sci Rep*. (2017) 7(1):17239.

Project Subject Area(s): Microbiome research, early life immunity, vaccine non-specific effects, cancer immunotherapy, bioinformatics/systems biology

Supervisor's Photo:

Researcher's Name: **Prof. David Lynn**
Researcher's Email: David.lynn@sahmri.com

Research Group Name: Lynn EMBL Australia Group
Location of Project: South Australian Health & Medical Research Institute, North Terrace, Adelaide CBD

Brief Outline of Project:

Prof. Lynn is Director of the Computational & Systems Biology Program at SAHMRI; an EMBL Australia Group Leader in the Microbiome & Host Health Program; and Professor at the Flinders University College of Medicine & Public Health. He leads a multidisciplinary group of researchers (5 postdocs; 1 RO; 2 PhD; 2 Honours students), who have advanced capacity to investigate the interactions between the microbiota, immune system and cancer using advanced preclinical models and to translate this work quickly into clinical trials. For example, we have recently shown that early life antibiotic exposure in mice leads to significantly impaired vaccine antibody responses to commercial vaccines administered to millions of infants worldwide (Cell Host Microbe, 2018). This has led to a new, NHMRC-funded (2019-2021 as CIA), clinical trial in human infants and is informing new research on microbiota-targeted interventions to boost vaccine efficacy. On the bioinformatics side, his group has developed a wide-range of bioinformatics software and online resources. These include InnateDB.com, an internationally recognised systems biology platform for network and pathway analysis (>50,000 users worldwide; >800 citations). We have also developed a range of network biology software including applications for dynamic network analysis (Bioinformatics, 2016) and software for the analysis of spatial transcriptomics data (Cell Systems, 2018). All of the honours students to date have obtained first class honours and several projects have resulted in first author publications for the honours student.

Projects are available in the following areas:

Investigating how the microbiota regulates immunity in early life. See Lynn et al., Cell Host & Microbe 2018. Lynn et al., Journal of Leukocyte Biology 2018.

The AIR clinical study – a study to investigate the influence of the microbiota on vaccine responses in human infants. (A partnership with Women's and Children's Hospital)

Investigating the impact of the microbiome on cancer immunotherapy efficacy and toxicity.

Vaccine non-specific effects – how do vaccines induce memory responses in the innate immune system.

Bioinformatics/Computational Biology – developing new tools and approaches for systems level analyses of innate immunity and cancer. Previous honour students have gotten first author papers in the leading computational biology journals. See Salamon et al., Cell Systems 2018; Goenawan et al., Bioinformatics 2016. Previous experience in programming is strongly recommended if seeking a purely computational biology/bioinformatics project, but mixed wet-lab/bioinformatics projects are a possibility for those without programming skills.

Link to more information about researcher or research group:
https://www.sahmriresearch.org/our-research/themes/infection-immunity/our-team/david-j-lynn-3

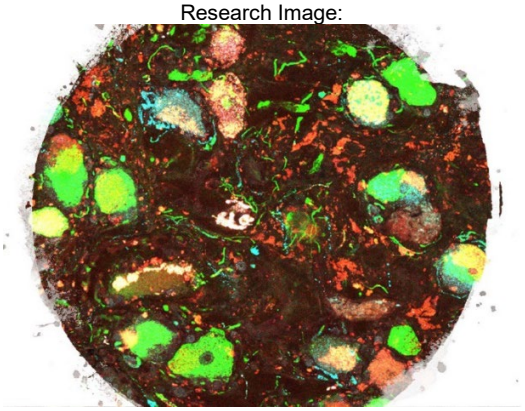
Project Subject Area(s):- Human Dorsal Root Ganglia

Supervisor's Photo:

Researcher's Name: **Rainer V Haberberger**
Researcher's Email:
rainer.haberberger@flinders.edu.au

Research Group Name: Pain & Pulmonary Neurobiology
Location of Project: FMC

Research Image:



Brief Outline of Project:

Dorsal root ganglia (DRG) contain the cell bodies of neurons responsible for the detection of important signals that lead to sensations such as pain, temperature and touch. The great expanse of DRG related knowledge in the pain field has been generated from studies of rat and mouse DRG, while human ganglia have been investigated far less. Understanding the cellular and molecular differences between human and rodent DRG will be instrumental in developing the next generation of targeted pain therapies, given the high failure rates of human studies developing treatments based on rodent data. Some of the critical gaps in knowledge centre around the following questions: What cell types in addition to neurons do we possess in our DRGs? How are blood vessels and immune cells connected to DRG neurons? The project will investigate different cell and tissue types in human DRG by using histochemistry, immunohistochemistry and confocal laser scanning microscopy. It will also help to demonstrate for the first time the fine structure of human DRG using the CLARITY method (https://en.wikipedia.org/wiki/CLARITY).

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/rainer.haberberger,
https://www.researchgate.net/profile/Rainer_Haberberger

Project Subject Area(s):- Neural mechanisms underlying motion vision

Supervisor's Photo:

Researcher's Name: **Karin Nordström**
Researcher's Email:
Karin.nordstrom@flinders.edu.au

Research Group Name: Motion vision
Location of Project: FMC

Research Image:

Brief Outline of Project:
Motion vision plays a key role in our every day lives, for getting around on the streets, avoiding collisions when driving, and for playing sports. Many animals also rely on motion vision cues, and some insects have excellent capabilities despite being equipped with small brains and low resolution compound eyes. What are the neuronal mechanisms that allow this? We use hoverflies as a model species. Surprisingly, despite having compound eyes, the insect brain processes vision in a very similar way to the vertebrate visual cortex. In addition, hoverflies are largely visually guided, like humans.

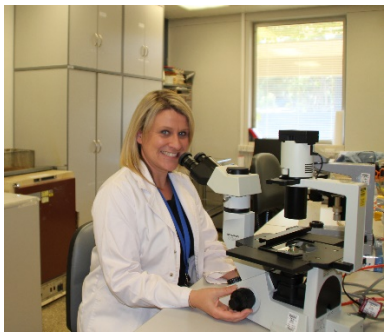
The honours student would learn to use electrophysiology to study visual neurons inside the hoverfly's central nervous system. By correlating the responses with what the hoverfly is seeing on a high-resolution screen, we can decipher the underlying mechanisms and algorithms. Besides electrophysiology, the student will also learn how to write analysis code in Matlab.

Insert brief outline of key points
Neural coding
Motion vision
Electrophysiology

Link to more information about researcher or research group:
http://hoverflyvision.weebly.com/

Project Subject Area(s):- Blood cancers, cancer cell metabolism, proteomics

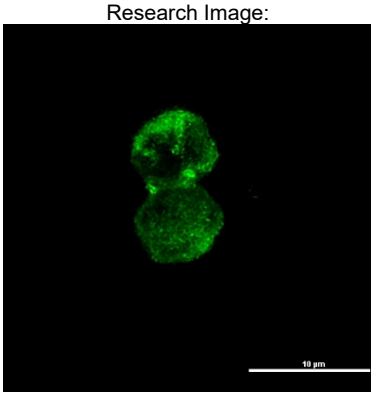
Supervisor's Photo:



Researcher's Name: **Dr. Lauren Thurgood**
Researcher's Email:
lauren.thurgood@flinders.edu.au

Research Group Name: Lymphoproliferative Disorders Research Group
Location of Project: Flinders Medical Centre

Research Image:



Brief Outline of Project:

My interest in cancer cell metabolism with a focus on the blood cancer, chronic lymphocytic leukemia (CLL). CLL is the most common leukemia in Australia and is characterised by a variable disease course. Some patients survive for several decades evading treatment, whilst others rapidly succumb to the disease. The disease is typified by the accumulation of mature, non-functional B-cells in the blood and primary lymphoid organs. These non-functional B-cells do not participate in the immune response, and patients frequently suffer serious infectious complications.

My preliminary work has shown that CLL cells appear to preferentially use lipids as their primary energy source and have altered metabolic pathways involving lipolysis/lipogenesis. There is also evidence in the CLL literature that the gene expression of CLL cells is similar to that of adipocytes. We have investigated the lipidome in CLL and made several interesting observations.

I also have an interest in the tumour microenvironment in particular understanding the cross-talk that occurs between the CLL cells and supporting cells found in the bone marrow and lymph nodes.

The basis of this honours project would to further expand on these observations in cell and animal models of CLL, as well as primary patient samples. The project options are varied and can be tailored based on the student's skills and interests. Some potential honours or PhD projects include:

* The role of lipids in activation of intracellular signalling pathways
* Identifying protein changes that occur to CLL cells after response to therapy
* Testing the effects of inhibitors against metabolic pathways on CLL cell growth and survival
* Identifying pro-survival proteins that drive CLL cell proliferation in the microenvironment and investigating the effects of novel therapies that can prevent this

University staff page can be accessed at: http://www.flinders.edu.au/people/lauren.thurgood

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Project Subject Area(s):- Cancer cell biology

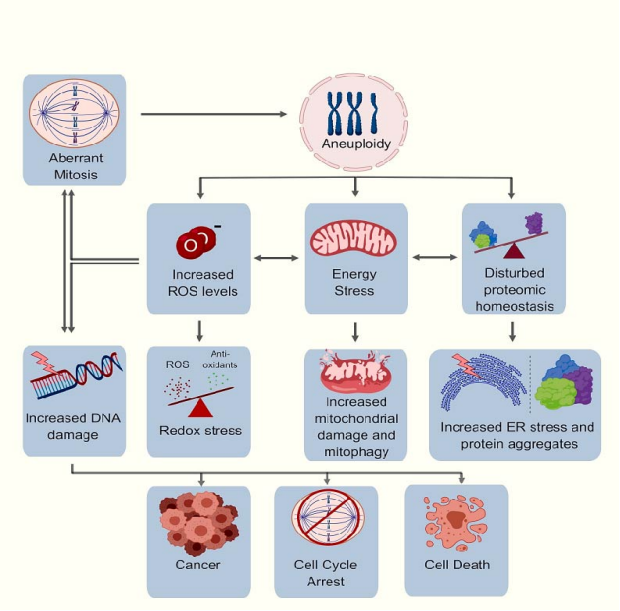
Supervisor's Photo:

Researcher's Name:
Dr Stephen Gregory
Researcher's Email:
greg0165@flinders.edu.au

Research Group Name:
Chromosomal instability and Cancer Group.

Location of Project:
Flinders Centre for Innovation in Cancer

Research Image:



Brief Outline of Project:

My research is focussed on finding new ways to target cancers cells. Specifically, we know that late stage cancers typically gain and lose DNA with each cell division and this chromosome instability has characteristic effects on the cell's metabolism that are not seen in normal dividing cells. Our current work is aimed at finding metabolic interventions that can leverage this difference between cancer and normal cells.

One project is to test our hypothesis that more genetically disrupted cancer cells will produce more reactive oxygen species (ROS), and that this will be a useful prognostic marker for stratifying patient treatments. We will use several methods including Raman spectroscopy to test leukemia samples for the connection between ROS and karyotype.

Another project is to test our hypothesis that there is a novel aneuploidy sensing pathway that connects gain or loss of chromosomes with metabolic disruption. We have identified several genes that seem to mediate this effect and are now in the process of investigating how they work so that we can specifically target late stage cancers.

Link to more information about researcher or research group:

https://www.flinders.edu.au/people/stephen.gregory
https://scholar.google.com.au/citations?hl=en&user=BRQjHskAAAAJ

Project Subject Area(s):- Circular RNAs as Molecular Biomarkers of Bowel Cancer

Supervisor's Photo:

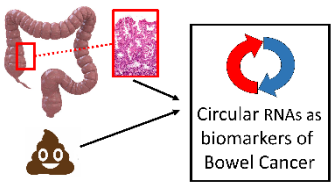
Researcher's Name: **Dr Simon Conn; Dr Erin Symonds**

Researcher's Email: simon.conn@flinders.edu.au; erin.symonds@flinders.edu.au

Research Group Name: Circular RNAs in Cancer

Location of Project: Flinders Centre for Innovation in Cancer Building

Research Image:



Brief Outline of Project:

Colorectal cancer (also known as bowel cancer) is the 2nd most common cancer affecting the Australian population. Approximately one-third of all colorectal cancers develop from polyps known as sessile serrated polyps. While removal of these polyps is effective in preventing colorectal cancer from developing, these lesions are rarely detected because (1) they present on the ascending colon, (2) have a mucous cap and are hypo-vascularized so are not detected in the faecal occult blood screen. Therefore, there is a need to identify non-invasive biomarkers of this pre-cancerous stage to reduce cancer incidence.

Circular RNAs, which comprise a recently-discovered family of RNA molecules, are ideal candidates as disease biomarkers. Circular RNAs are abundant, and hyperstable compared with other RNAs and are released from cells through exosomes or from cell death. Despite circular RNAs being abundant in body fluids, including blood and saliva, their abundance in faeces has yet to be determined.
Leveraging exciting preliminary data identifying specific circular RNAs enriched in diverse colorectal cancers, we will initially quantify their abundance in samples provided through a cancer surveillance program (the SCOOP program). We will supplement this approach by performing high-throughput RNA-sequencing on these sessile serrated polyps in the rare cases where they have been found to identify novel circRNAs and then quantify these in faecal and blood samples of these patients. This project will assess the early diagnostic and prognostic potential for circular RNAs in these clinically-evasive pre-cancerous polyps.

Link to more information about researcher or research group:

A/Prof. Simon Conn
https://www.flinders.edu.au/cancer/why-do-some-people-get-cancer

Dr. Erin Symonds, Bowel Health Service
https://www.flinders.edu.au/cancer/preventing-cancer-and-detecting-it-early

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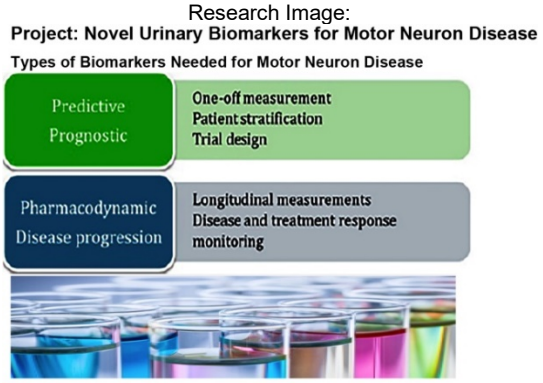
Project Subject Area(s):- Novel Motor Neuron Disease Biomarkers

Supervisor's Photo:

Researcher's Name: **Dr Mary-Louise Rogers**
Researcher's Email:
mary-Louise.rogers@flinders.edu.au

Research Group Name: MND&NR Laboratory
Location of Project: Flinders Medical Centre, Room 6E140, Phone 82045320; mob 0400152991

Research Image:



Brief Outline of Project:

Our laboratory was the first in the world to describe a urinary biomarker of motor neuron disease (called p75ECD) that is a pharmacodynamic biomarker and a predictive prognostic biomarker. The new project will be examining by proteomic and other analysis other urinary biomarkers that may also be prognostic or pharmacodynamic (Shepheard et. Urinary p75(ECD): A prognostic, disease progression, and pharmacodynamic biomarker in ALS. Neurology. 2017 Mar 21;88(12):1137–43).

Link to more information about researcher or research group:
See https://www.flinders.edu.au/people/mary-louise.rogers

Project Subject Area(s):- New treatments for pain: Pain-sensing nerve cells and sphingosine 1-phosphate

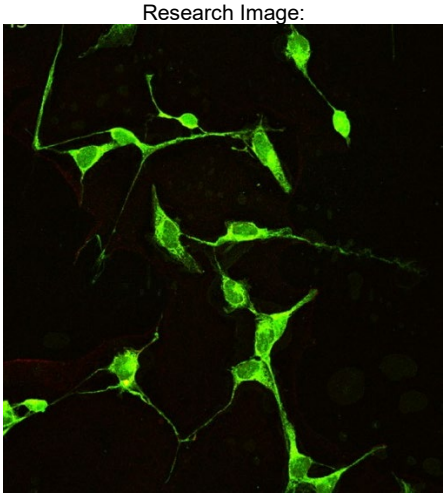
Supervisor's Photo:

Researcher's Name: **Rainer V Haberberger**
Researcher's Email:
rainer.haberberger@flinders.edu.au

Research Group Name: Pain & Pulmonary Neurobiology

Location of Project: FMC

Research Image:



Brief Outline of Project:

Chronic pain is a big problem as millions of people suffer from because usual anti-pain drugs such as Panadol or opioids don't work and cause addiction. The bioactive lipid sphingosine 1-phosphate (S1P) can change the function of peripheral pain sensing neurons. In recent years we could show that S1P and its receptors are not only involved chronic pain types but also in the development of pain sensors. More and more is known how the receptors for S1P are involved in pain but we need to understand how S1P works to be able to identify better targets for pain therapy. The project aims to describe the effects of blockage of S1P synthesis with new drugs on a pain-sensor like cell line. The student will practise skills such as neuronal cell culture, RT-PCR and multiple labelling immunohistochemistry to analyse cell-specific changes in pain transducing nerve cells.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/rainer.haberberger,
https://www.researchgate.net/profile/Rainer_Haberberger

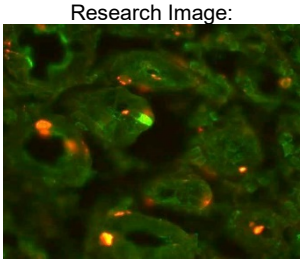
Project Subject Area(s):- How do gut endocrine cells control obesity and metabolism

Supervisor's Photo:

Researcher's Name: **Prof Damien Keating**
Researcher's Email:
damien.keating@flinders.edu.au

Research Group Name: Molecular and Cellular Physiology Lab
Location of Project: Flinders Medical Centre

Research Image:



Dual labelling of 2 different hormones (red and green) in endocrine cells lining the human gut wall

Brief Outline of Project:

Hormone-secreting cells in the gut (called enteroendocrine cells) collectively represent the largest endocrine tissue in our body. Yet we know the least about them in terms of their function. These cells are exposed to the food we eat, as well as to the bacterial world that inhabits us (the microbiome). Many of the hormones these cells release have major metabolic effects and some are already clinically-relevant drug targets to treat type 2 diabetes and obesity in humans.

This project will use human tissue to identify how gut endocrine cells respond to their environment, including in response to nutrients and the microbiome. Such information will allow us to identify new drug targets for metabolic diseases. We are the only group able to perform these investigations internationally, providing the opportunity to lead the world in this research area.

This project is currently funded by a major grant from the Australian Government (NHMRC) and we collaborate with several overseas teams. Students will therefore be provided with cutting edge projects involving international teams and with direct clinical relevance.

We regularly publish in high-impact international journals and nurture and support young researchers. We are a strong lab that can provide a supportive environment to help you see if you enjoy research and to develop your own career.

Lab website: http://www.flinders.edu.au/neuroscience/lab_molecular.html

Key recent papers:

J Clin Endocrinol Metab. 2019 Jul 1;104(7):2668-2674
JCI Insight. 2018 Dec 6;3(23). pii: 93936
Diabetes, 2017. 66(8):2144-2149
Mol Psychiatry. 2016 Jun;21(6):738-48.
Gastroenterology. 2015 Jul;149(1):253-5

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Project Subject Area(s):- A single target to eliminate diabetes and obesity

Supervisor's Photo:

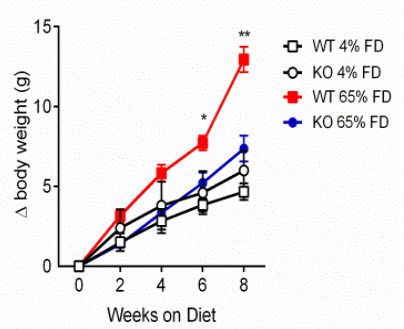
Researcher's Name: **Prof Damien Keating**

Researcher's Email:
damien.keating@flinders.edu.au

Research Group Name: Molecular and Cellular Physiology Lab

Location of Project: Flinders Medical Centre

Research Image:



Mice lacking RCAN1 expression (KO) placed on a high fat diet (65% fat) gain no extra weight compared to normal mice (WT) on the same diet.

Brief Outline of Project:

We have published several papers demonstrating that the protein RCAN1 controls cell signalling. More recent work now illustrates that RCAN1 is a major metabolic regulator, controlling insulin secretion important for diabetes, and also regulating weight gain by causing increased energy expenditure and weight loss.

We are now testing a series of small molecule inhibitors of RCAN1 to see whether they enhance insulin secretion and reduce fat storage. Whether these drugs work in mice, and how RCAN1 regulates insulin secretion and obesity, remain unknown and could be explored by a student in 2020.

This project is currently funded by a major grant from the Australian Government (NHMRC) and we collaborate with several overseas teams. Students will therefore be provided with cutting edge projects involving international teams and with direct clinical relevance.

We regularly publish in high-impact international journals and nurture and support young researchers. We are a strong lab that can provide a supportive environment to help you see if you enjoy research and to develop your own career.

Lab website: http://www.flinders.edu.au/neuroscience/lab_molecular.html

Key recent papers:

EMBO Rep. 2018 Dec;19(12). pii: e44706
PLoS Genetics. 2016 May 19;12(5):e1006033.
Diabetes. 2014 Jan;63(1):3-11.
Endocrinology. 2012 Nov;153(11):5212-21

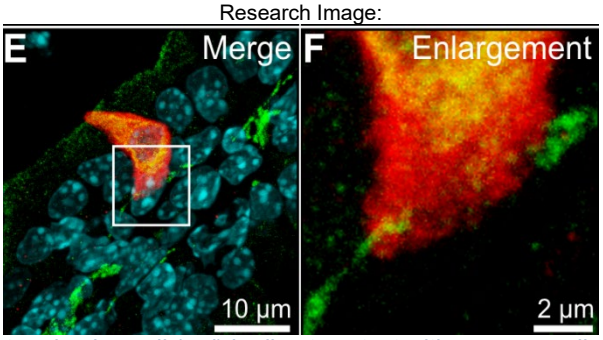
Project Subject Area(s):- The microbiome-gut-brain axis

Supervisor's Photo:

Researcher's Name:
Prof Damien Keating
Researcher's Email:
damien.keating@flinders.edu.au

Research Group Name:
Molecular and Cellular Physiology Lab
Location of Project:
Flinders Medical Centre

Research Image:



A gut endocrine cell (red) in direct contact with a nerve ending (green) linking gut signals to the brain.

Brief Outline of Project:

The bacteria in our gut (the microbiome) can signal to other parts of our body via nearby endocrine (hormone-secreting) cells lining the gut wall. This includes signals to nerves that control gut and brain function. How this occurs remains largely unknown. Our group has several projects underway that have identified key new pathways controlling microbiome-gut-brain signalling.

This project is currently funded by a major grant from the Australian Government (ARC) and we collaborate with several overseas teams. Students will therefore be provided with cutting edge projects involving international teams and with direct clinical relevance.

We regularly publish in high-impact international journals and nurture and support young researchers. We are a strong lab that can provide a supportive environment to help you see if you enjoy research and to develop your own career.

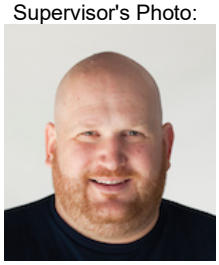
Lab website: http://www.flinders.edu.au/neuroscience/lab_molecular.html

Key recent papers:
Science. 2018 Sep 21;361(6408)
Cell. 2018 Oct 18;175(3):665-678
Cell. 2017 Jun 29;170(1):185-198.e16.
Cell. 2015 Apr 9;161(2):264-76

College of Medicine
& Public Health

Project Subject Area(s):- Modulation of pain responses in a peripheral nervous system model

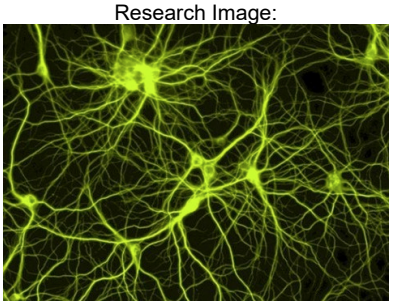
Supervisor's Photo:



Researcher's Name: **Dr. Dusan Matusica**
Researcher's Email: dusan.matusica@flinders.edu.au

Research Group Name:
Pain & Pulmonary Neurobiology
Location of Project: FMC, levels 4 and 6

Research Image:



Brief Outline of Project:

Pain is a significant global health problem and seems to be the most burdensome health issue facing the planet– about as costly as diabetes and cancer combined. Every fifth Australian, or 20% of the Australian population suffers from chronic pain. An important element in the development of neuropathic pain are problems with the function of peripheral nerves. Because neurotrophic factors are not only important for the development but also the maintenance of neurons, targeting neurotrophic factors and their signalling pathways can restore nerve function and reduce or stop neuropathic pain.
Blocking the activity of nerve growth factor or enhancing the activity of either glial-derived neurotrophic factor or artemin has shown potential for normalizing neuronal activity and attenuating signs of neuropathic pain in animal models and clinical studies. Recent advances in understanding how post-translational modifications of growth factor receptor p75NTR playing an important role in regulating neuronal function. That's why regulation of these mechanisms is the current focus of our research. This receptor is also a target for new generations of drugs, which modulate the noxious signalling pathways associated with pain. The aim of this project is to develop an in-vitro assay for the screening of peptides with potential therapeutic potential using sensory neuron cell lines with the aim of establishing a standardised functional readout based on biochemical and histological analysis. Methods in use include, cell culture, basic pharmacology, immunohistochemistry, Western blotting, brightfield and confocal microscopy and qRT-PCR.

Link to more information about researcher or research group:
http://www.flinders.edu.au/neuroscience/lab_pain.html
https://www.researchgate.net/profile/Dusan_Matusica
https://www.flinders.edu.au/people/dusan.matusica

Project Subject Area(s):- A rapid assembly minigene mRNA splicing assay for the functional characterisation of DNA sequence variants identified in glaucoma associated genes.

Researcher's Name: **Andrew Dubowsky**
Researcher's Email: andrew.dubowsky@sa.gov.au

Research Group Name: SA Pathology in collaboration with the Department of Ophthalmology
Location of Project: Flinders Medical Centre

Brief Outline of Project:

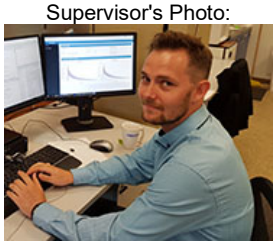
Clinical management of childhood glaucoma benefits most from genetic testing when an informative molecular diagnosis can be delivered. Adequately classifying and reporting genetic variants requires evidence available from segregation studies and/or functional assays. One class of sequence variant accepted as disease causing, are those which effect aberrant RNA splicing. Unfortunately expression of RNA from genes associated with glaucoma is tightly regulated and cell specific. mRNA splicing studies performed as part of a diagnostic test therefore require an alternative approach than assay using routinely collected blood samples.

The project is comprised of 3 steps; 1) Developing a minigene expression vector to facilitate rapid and routine clone assembly using the Invitrogen Gateway recombination technology, 2) mRNA expression of cloned sequence variants following transfection into human cell lines, and 3) characterisation of mRNA splice variants.

Insert brief outline of key points;
The project will require application of standard molecular biology techniques, including PCR, Sanger sequencing, bacterial cloning, and mammalian cell culture. Current guidelines for clinical classification of suspected splice variants require that aberrant splicing be demonstrated empirically; results from this work is expected to provide evidence for the clinical classification of these variants, assisting in the clinical management of patients and their families.

Project Subject Area(s):- Precision Medicine, Clinical Epidemiology, Oncology, Pharmacology

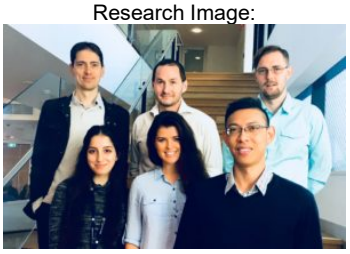
Supervisor's Photo:



Researcher's Name: **Dr Ashley Hopkins**
Researcher's Email: ashley.hopkins@flinders.edu.au

Research Group Name: Precision Medicine Group, Flinders Centre for Innovation in Cancer
Location of Project: FMC

Research Image:



Brief Outline of Project:

A range of research projects are available in the Precision Medicine Group. My research focus is precision oncology. I aim to develop prognostic tools for advanced cancer treatments using clinical epidemiology and pharmacometric techniques.

Prognostic tools allow the presentation of personalised likelihoods of response and adverse effects to medicines. Such information allows informed decision to be made. This is particularly important in advanced cancers where there are significant consequences to the high variability in the likelihood and severity of adverse effects, as well as response to the various treatments.

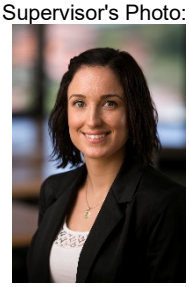
The data with which the prognostic tools are made are typically “big data”, sourced from clinical trials conducted by pharmaceutical companies, or from data registries. The data includes large amounts of demographic, laboratory and tumour data which may be predictive of efficacy or toxicity to cancer medicines.

At present we have access to individual participant data from over 60,000 advanced breast, lung, prostate or colorectal cancer patients treated with immunotherapies, targeted therapies and chemotherapies. Depending on the interests of prospective students a range of analyses and projects are available in these cancers and medicines. Our group declares funding from the National Breast Cancer Foundation, NHMRC, Tour De Cure, Cancer Council SA, and Pfizer. Prospective students would require an interest in improving cancer care, clinical epidemiology and pharmacology.

Link to more information about researcher or research group:
http://www.flinders.edu.au/people/ashley.hopkins

Project Subject Area(s):- Evaluation of a portable light device for phase advancing the circadian rhythms of those suffering sleep onset insomnia

Supervisor's Photo:



Researcher's Name: **Nicole Lovato**
Researcher's Email: nicole.lovato@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health
Location of Project: AISH Sleep Laboratory

Research Image:

Brief Outline of Project:

Circadian rhythms fundamentally determine the timing of sleep and wakefulness across the 24-hour day. An individual with a 'normally' timed circadian rhythm will typically fall asleep at approximately 11pm and wake around 7am. However chronic sleep difficulties can occur when the circadian rhythm is mis-timed, leading to a sleep-wake rhythm that does not coincide with an individual's preferred sleep-wake schedule. A late timed circadian rhythm can lead to difficulty falling asleep. Sleep onset insomnia is associated with delays of the circadian rhythm in the order of 2-3 hours. Later sleep onset times increase the tendency to sleep later into the morning in a bid to obtain sufficient sleep. However, when required to rise for work or social obligations (e.g. at 7am), an individual with a delayed circadian rhythm will experience extreme difficulty as they are attempting to rise at the time of maximum circadian sleepiness. The negative experience of this physiologically based difficulty, coupled with insufficient sleep, can amplify the negative consequences of difficulty falling asleep and reinforce the cycle of chronic insomnia.

Appropriately timed exposure to bright light can re-time (or phase shift) the circadian rhythm and consequently alleviate the associated sleep difficulties and daytime sequelae. Although the efficacy of morning bright light has been well established to advance (move earlier) the circadian phase, few studies have investigated its efficacy for the treatment of sleep onset insomnia associated with a delayed circadian phase. Bright light has traditionally been administered using a 'light box', which requires individuals to maintain a fixed position in front of the box. This is impractical and impacts significantly on treatment compliance. Since the development of light boxes, it has become well established that coloured blue/green light, as opposed to white light, produces a superior therapeutic response.

Based on a great deal of our previous research from our group showing that optical devices using small Light Emitting Diodes, particularly using blue/green light, can change the timing of our endogenous body clock, commercial devices have been developed. These devices are now available to the public for a variety of beneficial effects including the treatment of circadian rhythm disorders contributing to insomnia, jet-lag, winter depression and shift work disorder.

These commercial devices based on this earlier research need to be validated for their effectiveness. We have previously shown that they are effective at delaying the body clock timing when used in the evenings, and advancing the body clock timing when used in the mornings. This research was conducted using individuals who experience typically good sleep. We need now to show their effectiveness in shifting the body clock when used in a clinical population with sleep onset insomnia. No other light therapy devices on the market at present have evidential support for their effectiveness.

Link to more information about researcher or research group:
www.adelaidesleephealth.org.au/research_and_volunteering/current_projects

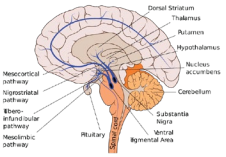
Project Subject Area(s):- Brain Science, Neuroscience and Physiology

Supervisor's Photo:

Researcher's Name: **Yoichiro (YoYo) Otsuka**
Researcher's Email: yoichiro.otsuka@flinders.edu.au

Research Group Name: Integrative Neuroscience Lab
Location of Project: 6E410

Research Image:



Brief Outline of Project:

Our lab is pursuing the brain fear circuitry for psychogenic autonomic responses, by combining state-of-the-art biotechnological techniques with conscious/ anaesthetised animal physiological and neuroanatomical experiments.

Emotions are a part of essential biological functions that are needed to enable animals to forage for food, reproduce, and thus survive in wild environments. Emotionally significant events trigger complex sets of behavioural responses, which are integrated with dynamic physiological changes that allow adaptation to stressful events. Changes sometimes exceed the regulatory range, leading to states of illness. Indeed, patients with mental illness show a high prevalence of metabolic syndrome and cardiovascular diseases. The physiological principles that underlie psychogenic diseases are one of the big mysteries in today's fields of physiology, neuroscience and biological psychiatry. To understand the principles, it is crucial to establish a brain fear/emotion circuit via which emotional signals trigger these dynamic physiological responses [1]. Our lab has addressed this black box [2,3].

Experiments will be conducted in experimental animals (rats/mice). The project will investigate whether activation or inhibition of neurons in a specific brain area alters stress-associated physiological changes. Miniature probes will be chronically implanted for recording bio-physiological signals. To control brain neurons activity, particular exogenous protein will be expressed in the neurons by genetic alteration using adeno-associated viral vectors and transgenic animals

Methods and Major equipment/techniques: The project will fall into Brain Neuroscience research field. Honours students will have opportunities to learn general animal surgery and the following significant techniques; 1) Recording bio-physiological signals such as brain and heart electrical signals, and body temperature in anesthetized or conscious live animals, 2) Controlling neuronal activity with state-of-the-art techniques including Optogenetics [4] and Designer Receptors Exclusively Activated by Designer Drugs (DREADD) [5]. 3) Computer programming to analyse bio-physiological signal data.

Key References:

1. Mohammed M et al., Brown adipose tissue thermogenesis contributes to emotional hyperthermia in a resident rat suddenly confronted with an intruder rat. Am J Physiol Regul Integr Comp Physiol. 306(6):R394-400 (2014)
2. Mohammed,M et al., Lateral habenula regulation of emotional hyperthermia: mediation via the medullary raphé. Sci Rep. 2017,7(1):4102
3. Ootsuka Y et al. Activation of the habenula complex evokes autonomic physiological responses similar to those associated with emotional stress. Physiol Rep 2015, 3(2). pii: e12297
4. Karl Deisseroth, Optogenetics, Nature Methods 8, 26–29 (2011)
5. Dong,S.,et al., A chemical-genetic approach for precise spatio-temporal control of cellular signaling. Molecular bioSystems 6, 1376-80 (2010)

Link to more information about researcher or research group:

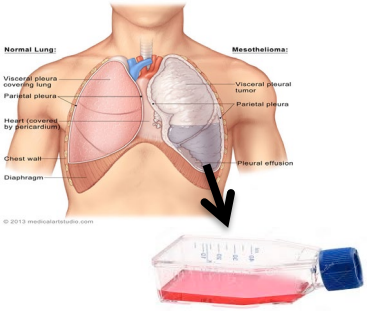
http://www.flinders.edu.au/neuroscience/lab_integrative.html
https://www.researchgate.net/profile/Youichirou_Ootsuka

Project Subject Area(s):- Characterisation of cancer stem cells in malignant pleural effusions

Supervisor's Photo:

Researcher's Name: **Sonja Klebe**
Researcher's Email: sonja.klebe@sa.gov.au
Research Group Name: Anatomical Pathology
Location of Project: 4D105, Flinders Medical Centre

Research Image:



Brief Outline of Project:

A malignant pleural effusion is the accumulation of fluid in the pleural cavity as a result of malignancy. The most common causes of malignant pleural effusion are malignancies that have metastasised to the pleural cavity, including breast and lung cancer. Malignant pleural mesothelioma, a tumour arising in the mesothelial cell lining the pleural cavity, also commonly results in malignant pleural effusion. Malignant pleural effusion causes breathing difficulties. The effusion is routinely drained, not only to ease symptoms but also for diagnostic purposes, since this fluid may contain malignant cells that have shed from the tumour. Anywhere between 20 mL and 3 L of effusion can be drained, but typically only 50 mL is needed for diagnosis. We collect remaining fluid for our research.

Tumours can harbour cancer stem cells, which can self-renew and differentiate into mature cancers cells. Cancer stem cells are hypothesised to be a chief driver of cancer recurrence due to their intrinsic therapeutic resistance that is a result of high expression of multidrug transporters, heightened DNA damage checkpoint activation and repair and differences in cell-cycle kinetics.

Project aim:

Isolate and characterise cancer stem cells from malignant pleural effusion and determine if they are a valuable resource to test cancer stem cell-targeted therapies.

University staff page can be accessed at:
https://www.sapathology.sa.gov.au/wps/wcm/connect/sa+pathology+internet+content+new/content/clinicians/pathologists/klebe%2C+associate+professor+sonja

Clinical Science Based Honours Projects available in 2020

Project Subject Area(s):- Psycho-physiology of sleep, sleep disruption and circadian rhythms

Supervisors' Photo:

Researcher's Name: **Dr Gorica Micic**
Researcher's Email:
Gorica.micic@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health

Location of Project: Adelaide Institute for Sleep Health & the Nick Antic Sleep Laboratory

Research Image:

Brief Outline of Projects:

Wind farm noise & sleep: Expansion of wind farm facilities in Australia has been associated with widespread community complaints regarding sleep disturbance and adverse health effects. Wind farm noise exposure clearly has the potential to adversely affect sleep, health and well-being. Data are clearly needed to definitively establish the sleep disruption characteristics of wind farm noise compared to other noise disturbances in sleep. The study has three parts that a student could potentially be involved with:

1. A survey of people exposed to wind farm or traffic noise.
One of the aims of the survey is to compare responses about sleep disturbance from people exposed to wind farms and people who live in noisy night-time traffic conditions, which are already known to disturb sleep.

2. An in-home study of sleep and noise in people affected by noise.
Self-reported (subjective) and direct objective measures of sleep quality assessed in participants' natural home and noise environment to investigate relationships between noise, sleep disturbances and other factors.

3. A laboratory study to investigate noise effects on sleep in a controlled sleep and noise environment.
Gold-standard sleep and physiological activation responses to a range of noises are being used to carefully test noise impacts on sleep macro-structure (sleep stage distribution and wake time during the sleep period), and sleep micro-structure (brief arousal and physiological activation responses).

More information about this study is available at http://www.flinders.edu.au/wind-farm-noise-study.

Longitudinal assessment of sleep: The British Cohort Study is an ongoing multi-disciplinary and longitudinal survey monitoring the development of 17,000 babies born in the UK between 5th-7th April 1970. These individuals have been followed up 10 times since birth, every 5-10 years with various health and lifestyle questionnaires, and the most recent sweep was at age 46. The student on this project will investigate predictors and variables associated with sleep outcomes across the lifespan. Specific aims of the project may be tailored to our group's expertise and the student's interest.

Link to more information about researcher or research group:
https://www.flinders.edu.au/adelaide-institute-sleep-health

Project Subject Areas: Sleep Health, Insomnia, Sleep Apnea, Quantitative EEG

Supervisor's Photo

Researcher's Name: **Dr Alexander Sweetman, Dr Andrew Vakulin, Prof. Peter Catcherside**

Researcher's Email: alexander.sweetman@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health

Location of Project: Mark Oliphant Building, Flinders University

Research Image (AISH):

Adelaide Institute *for* **Sleep Health**

Brief Outline of Project:

We recently completed a randomised controlled trial investigating treatment approaches in patients with co-occurring insomnia and sleep apnea. 145 patients were randomised to 4-sessions of cognitive and behavioural therapy for insomnia, vs. no insomnia-treatment, before 4-months of CPAP therapy. Patients completed home sleep studies at 4 key follow-up periods throughout the study, providing integral objective sleep and physiological data.

We are seeking a BMedSci Honours student with an interest in randomised controlled trial research, and objective measurement of EEG, ECG, respiratory, and other physiological traces, to investigate changes in quantitative EEG data during treatment in these co-occurring insomnia + sleep apnea patients.

The project has standing ethics approval, and all necessary data are collected. We will assist an interested student with literature review, hypothesis generation, and software to analyse qEEG data.

Link to more information about researcher or research group:

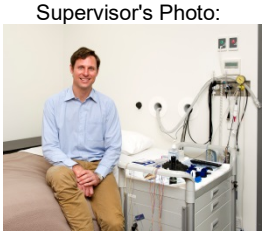
AISH website: https://www.flinders.edu.au/adelaide-institute-sleep-health

Protocol information for the RCT of co-morbid insomnia and sleep apnea (ANZCTR):
https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=365184

2017 Review of 'co-morbid insomnia and sleep apnea' research by AISH group:
https://www.sciencedirect.com/science/article/abs/pii/S1087079216300107

Project Subject Area(s):- Human upper airway physiology to investigate the causes of and new treatments for sleep disordered breathing

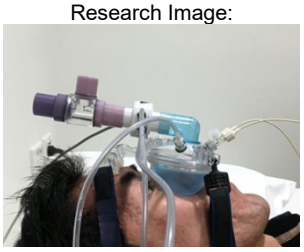
Supervisor's Photo:



Researcher's Name: **Prof. Danny Eckert**
Researcher's Email: danny.eckert@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health (AISH)
Location of Project: AISH Sleep Laboratory

Research Image:



Brief Outline of Project:

The Adelaide Institute for Sleep Health research team works alongside the Sleep Health Service, Southern Adelaide Local Health Network, to provide multi-disciplinary research relevant to a broad range of clinical and other sleep problems. AISH is one of the leading clinical research laboratories in Australia with major research interests in clinical sleep research, respiratory physiology, sensory and reflex processes in sleep, neurocognitive performance, insomnia and noise disturbance effects on sleep.

Professor Danny Eckert returned to AISH in early 2019 after ~6 productive years in Boston and another ~7 years in Sydney. In collaboration with other members of the AISH team, there will be a number of projects on offer aimed at improving understanding of obstructive sleep apnoea and respiratory disease pathophysiology, identification of novel therapeutic targets, and development of new-targeted therapies as part of a comprehensive translational research program. A variety of experimental approaches will be used to measure upper airway neuromuscular control and respiratory mechanics in humans to advance knowledge of basic mechanisms through to multicentre clinical trials to test new therapies including pharmacotherapies.

Students interested in clinical sleep research and/or human respiratory/sleep physiology are encouraged to contact one of the AISH research team members to discuss potential honours projects in more detail.

Link to more information about researcher or research group:

https://www.flinders.edu.au/adelaide-institute-sleep-health
https://www.flinders.edu.au/people/danny.eckert
https://www.linkedin.com/in/danny-eckert-ab1183b/?originalSubdomain=au

Project Subject Area(s):- Mental Health

Supervisor's Photo:

Researcher's Name: **Niranjan Bidargaddi**
Researcher's Email: Niranjan.bidargaddi@flinders.edu.au

Research Group Name: Personal Health Informatics Lab
Location of Project: SAHMRI or Tonsley

Research Image:

https://phit.flinders.edu.au

Brief Outline of Project:

Recent advances in mobile devices and wearable sensors make it possible to deliver support via phone to users, anytime, anyplace. Smartphone-based behaviour change interventions overcome a major limitation of traditional approaches in relation to the delivery of treatments. Smartphone based data gathering allows behaviours and mental health state to be monitored in real time. As and when moments of stress are detected or predicted from such data, supportive strategies can be immediately initiated. This approach to behaviour change interventions allows individuals to receive micro-support in their daily life as and when they need it via their mobile phone. Such in-moment interventions, which adapt dynamically to an individual's changing internal and contextual state, are known as Just-In-Time Adaptive Interventions (JITAIs). These interventions can capitalise on data that is collected via mobile sensing technology (e.g., smartphones, wearable blood alcohol monitors, physiological monitoring sensors, etc.) to detect contexts and trigger the right type or amount of support, at the right time, in real-life.

Our lab has expertise in the development and evaluation of mHealth interventions across the spectrum of mental health disorders. Building on the MindTick smartphone app (mindtick.phit.flinders.edu.au, https://news.flinders.edu.au/blog/2018/08/13/us-experts-dials-digital-mental-health-applications/) platform, which is currently being trialled in mental health services, we offer the following possible projects suitable for Honours.

Personal digital footprints: Understanding types, how to access and use consumer data in Australia

Digital footprints describe the data consumers leave behind every day when interacting with any form of technology. On 26 November 2017, the Australian Government announced the introduction of a consumer data right in Australia to improve consumers' ability to compare and switch between products and services. A precursor to this is to gain an understanding of what types of consumer data currently exist.

The student working on this project will identify services and devices that create digital footprints in Australia (e.g. online shopping, banking, wearables, social media, email interactions, etc.) and do a scoping review on the utility of digital footprints in health. Subsequently, they will design a study to recruit and collect digital footprints from (n= 10-20) participants to understand the process of obtaining these records, how these records can be used for health purposes, and what are the barriers that need to be overcome before it can be used for health purposes.

The outcomes of this study will help close the gap in knowledge on how digital footprints can be collected and used for health purposes.

Family participation in the diagnosis and management of mental illnesses

Obtaining information from family members to assist in the diagnosis and management of mental illnesses is a standard practice. However this information is only gathered when family members attend clinical appointments. The aim of this study is to devise an app that assists carers of mental health patients to record mental health related metrics for themselves, and for the patient under their care, as and when they occur or are observed in everyday living. Students working on this study will recruit family members and carers to co-design and pilot test the app in collaboration with technical staff in our lab.

Experimenting and learning assistive app: Help individuals to record their daily medication intake decision and responses data

Patients on antipsychotic medication are continually grappling on a day to day basis with medication decisions: to take or not take, shall I increase or decrease dose, what time of the day is best to take the tablet, should I take it before or after food etc. The desired outcome is to reduce side effects and symptoms. The aim of this project is to design an app (together with the technical personnel at our lab) that will help patients record their medication decisions and outcomes and present insights from the data, to help patients to optimise personal medication strategies. The app will assist patients to self-examine from their own day to day experimentations, and ultimately help identify what works best for them. Students working on this project will first conduct a review of medication apps, and conduct focus groups with mental health patients to design, prototype and test the app.

Continuously monitoring alcohol use and related behaviours from the natural environment using a smartphone app and breathalyzer: A pilot study

In recent years, significant advances have been made in the development of mobile devices to gather data on alcohol use and related behaviours from natural environment. These approaches provide data useful to phenotype real world drinking patterns as well as facilitating personalised early intervention. We have devised a novel protocol to collect real-time emotions and environmental factors through a smartphone app, and blood alcohol levels through a Bluetooth enabled breathalyser. An exploratory pilot of this application is underway with the student population. This project can support two students.

The first student working on this project will oversee the completion of the current pilot study and analysis of the data. The second student will refine the protocol for use by Drug and Alcohol service providers in SA and conduct a pilot to support populations suffering from alcohol use disorders. This student will participate in review, protocol development, and developing the ethics application.

Developing m-Health solutions to monitor progress of rehabilitation and recovery after cancer treatment

Cancer aftercare guidelines for oncology professionals recommend paying attention to the early detection and recognition of psychological distress, fatigue, pain, problems with daily activities, lifestyle risks, and also stimulating self-care within the first year after completing the primary curative cancer treatment. This study will examine the utility of specialized mobile health apps and tele-monitoring services for assisting clinicians to meet this recommendation. Students working on this project will first conduct a review of use of m-health monitoring applications in cancer care. Subsequently they will design a protocol and conduct a pilot to demonstrate the feasibility and acceptability of real time monitoring data in cancer services.

Link to more information about researcher or research group:

Dr Yasmin Van Kasteren, Research Fellow

Dr Sarah Immanuel, Research Fellow

A/Prof Geoff Schrader, Psychiatrist

Dr Jorg Strobel, Psychiatrist

Insert web links

https://www.flinders.edu.au/people/niranjan.bidargaddi

https://phit.flinders.edu.au

https://www.sahmriresearch.org/our-research/themes/mind-brain/groups/digital-psychiatry-and-personal-health-informatics

College of Medicine
& Public Health

Project Subject Area(s):- Human upper airway physiology during sleep

Supervisor's Photo:

Researcher's Name: **Dr Jayne Carberry**
Researcher's Email: jayne.carberry@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health
Location of Project: AISH Sleep Laboratory

Research Image:

Brief Outline of Project:

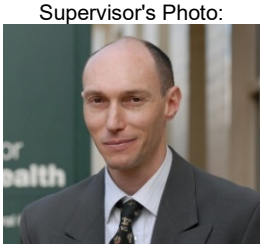
The Adelaide Institute for Sleep Health (AISH) research team works alongside the Sleep Health Service, Southern Adelaide Local Health Network, to provide multi-disciplinary research relevant to a broad range of clinical and other sleep problems. AISH is one of the leading clinical research laboratories in Australia with major research interests in clinical sleep research, respiratory physiology, sensory and reflex processes in sleep, neurocognitive performance, insomnia and noise disturbance effects on sleep.

Dr. Carberry joined the AISH team from NeuRA/UNSW in Sydney in October 2018; her research focuses of various aspects upper airway physiology and the sleep and breathing disorder, obstructive sleep apnoea (OSA) in humans. She uses neurophysiological techniques to study human upper airway muscle activity and airway mechanics during wakefulness and sleep. Her projects look at mechanisms of upper airway muscle dysfunction, a key pathophysiological cause for sleep apnoea. Other projects include novel pharmacological approaches for targeted therapy in OSA.

Link to more information about researcher or research group:
https://www.flinders.edu.au/adelaide-institute-sleep-health
https://www.flinders.edu.au/people/jayne.carberry

Project Subject Area(s):- Sleep and Respiratory Physiology and Medicine

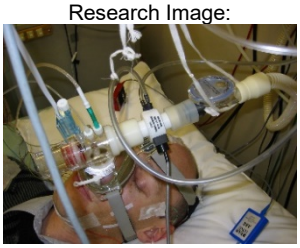
Supervisor's Photo:



Researcher's Name: **Prof. Peter Catcheside**
Researcher's Email: peter.catcheside@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health
Location of Project: AISH Sleep Laboratory

Research Image:



Brief Outline of Project:

The Adelaide Institute for Sleep Health (AISH) is one of the leading sleep research laboratories in Australia with major research interests in clinical sleep research, respiratory physiology, sensory and reflex processes in sleep, neurocognitive performance, insomnia and noise disturbance effects on sleep. Through collaborations with the College of Science and Engineering, College of Education, Psychology and Social Work, the Cooperative Research Centre (CRC) for Alertness, Safety and Productivity (www.alertnesscrc.com), and other initiatives, AISH research is focussed on understanding mechanisms underpinning sleep and respiratory problems, and developing new methods to improve outcomes for patients through better personalised treatments tailored to individual variability in underlying problem causes and consequences.

Potential Honours projects could
a) use a new quantitative method for assessing breathing effort to better understand interactions between respiratory disturbances and fragmented sleep
b) examine physiological disturbances associated with noise exposure during sleep
c) investigate other aspects of sleep physiology.

Students interested in clinical sleep research and/or human respiratory/sleep physiology are encouraged to check the website for more information, and to contact one of the AISH research team members to discuss potential honours projects in more detail.

Link to more information about researcher or research group:
https://www.flinders.edu.au/adelaide-institute-sleep-health
https://www.flinders.edu.au/people/peter.catcheside

Project Subject Area(s):- Sleep Health Services Research – Translation of sleep health management into primary care

Supervisor's Photo:

Researcher's Name: **Doug McEvoy**
Researcher's Email: doug.mcevoy@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health
Location of Project: AISH Sleep Laboratory

Research Image:

Brief Outline of Project:

Healthy sleep is vital for good physical and mental health. Sleep disorders and voluntary and societally-driven sleep restriction have a major negative impact on health, productivity and safety in Australia and internationally. A conservative estimate of the direct and indirect economic cost in Australia of the two most common disorders of obstructive sleep apnoea and insomnia alone is over $5 billion per year. Disturbingly, current health services and policy fail to cost-effectively manage these disorders; through over-reliance on too complex and costly sleep apnea tests, unregulated industry practices often failing to deliver good outcomes for patients, and poor treatment selection and access in primary care.

To address this problem the Adelaide Institute for Sleep Health (AISH) was recently awarded a large Centre of Research Excellence (CRE) research program grant by the National Health and Medical Research Council (NHMRC). The CRE- National Centre for Sleep Health Services Research brings together an extensive network of internationally recognised experts in sleep and respiratory medicine/research, general practice, nursing, pharmacy, health services and policy research, epidemiology, health economics and sleep health technologies. Using this expertise the CRE will show how primary care can be placed at the centre of sleep disorders service delivery. The focus will be on deployment of simplified, cost-effective, evidence-based methods for diagnosing and managing sleep problems in primary care, with primary care practitioners better connected and supported with specialist sleep services in a “hub and spoke” model.

There are a number of potential honours project opportunities available through the CRE program, including mixed methods qualitative research to better understand the barriers and enablers of sleep health management experienced by health professionals in primary care, development and testing of practice guidelines for sleep health management and evaluating/ testing technology innovations to assist with sleep health management.

If you are interested in honours project opportunities in health services research and would like to play a part in this directly translatable research initiative, please do not hesitate to reach out via email for any more information about the project and/or to set up a face to face meeting to discuss possible projects further.

Link to more information about researcher or research group:

https://www.flinders.edu.au/adelaide-institute-sleep-health/research-projects
http://www.flinders.edu.au/people/doug.mcevoy

Project Subject Area(s):- Assessing the performance of a new fitness to drive test in patients with obstructive sleep apnea

Supervisor's Photo:

Researcher's Name: **Andrew Vakulin**
Researcher's Email: andrew.vakulin@flinders.edu.au

Research Group Name: Adelaide Institute for Sleep Health
Location of Project: AISH Sleep Laboratory

Research Image:

Brief Outline of Project:

Obstructive sleep apnea (OSA) is a common sleep disorder linked with increased daytime sleepiness, impaired driving performance and increased motor vehicle accident risk. However, not all patients are impaired by OSA and identifying which patients are affected is a daily clinical challenge for sleep specialists. To address this problem, the main aim of this project is to validate a new assessment of driving impairment in patients with obstructive sleep apnea (OSA) towards developing a clinically deployable, simplified and cost effect fitness to drive assessment.

The current gold standard clinical test for daytime sleepiness is the maintenance of wakefulness test (MWT), which assesses the patient's ability to stay awake in a controlled sleep laboratory soporific environment. The problem with this test is that it is an all-day, labour intensive and expensive test, limiting its utility to only in a small portion of OSA patients where excessive sleepiness is clear or work regulations require the test (professional drivers). This leaves most patients with OSA untested in regards to the risk of alertness failure while driving, and hence forms the rationale for this research to develop a much simpler fitness to drive assessment.

As part of a larger project funded by the National Health and Medical Research Council of Australia (NHMRC), there is a unique opportunity for an enthusiastic student to undertake an honours project. The project would involve comparing the ability of the current MWT gold standard sleepiness test vs the new simplified assessment to predict driving impairment in both OSA patients and healthy matched controls. The protocol will involve sleep deprivation and driving simulator assessments. As part of the broader project there will also be measurements including, sleep and wake EEG, balance tests, skin temperature measures as well as biological (blood and saliva) samples towards further biomarker discovery. This provides a range of opportunities for other project topics and questions to be explored with interested prospective students.

If you are interested in this honours project opportunity, please do not hesitate to reach out via email for any more information about the project and/or to set up a face to face meeting to discuss the project further.

Link to more information about researcher or research group:
https://www.flinders.edu.au/adelaide-institute-sleep-health/research-projects
http://www.flinders.edu.au/people/andrew.vakulin

Public Health Based Honours Projects available in 2020

Project Subject Area(s): media analysis; sexual behaviour (dating apps); public health

Supervisor's Photo:

Research Image:

Researcher's Name: **Dr Emma Miller**
Researcher's Email: emma.miller@flinders.edu.au

Location of Project: Health Sciences Building, Level 2

Brief Outline of Project:

Gonorrhoea is increasing in young people from low SES areas, but the reasons are unclear. Our hypothesis is that the recent and dramatic shift in young people's dating (from meeting people 'in the flesh' to using dating apps like Tinder) is leading to an increasing number of sexual partners, changing sexual risk behaviours and making condom-less sex a much more socially acceptable and normalised behaviour, as has been suggested in MSM. If this is the case, the increasing numbers of sexual partners with condom-less sex could change the epidemiology of other STIs and HIV and represent a potential 'public health disaster'.

Dating apps are changing the social rules on how sexual encounters are initiated, heralding a cultural shift in how young people think and behave in relation to sex. Tinder is the most widely used dating app in Australia with 23 billion swipes each year and anecdotal evidence suggests that its use is swiftly becoming normalised in the mainstream media.

This project will examine changes in how Tinder and other dating apps are represented in the mainstream media. The project will chart the extent and salience of media representations of Tinder over time mapped against market data available from Tinder to identify pivotal points from its introduction and peaks in usage since that time. Specifically, the project will analyse:
- relevant newspapers articles;
- online stories and related social media;
- television and YouTube advertising.

The project will provide important contextual information on which to base future investigations of how the sexual practice of young people may be being shaped by the introduction of Tinder. Understanding this will be crucial in responding to increasing gonorrhoea in Australia.

Link to more information about researcher or research group:
http://www.flinders.edu.au/people/emma.miller

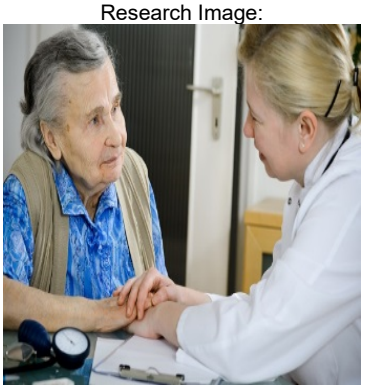
Project Subject Area(s):- Clinical Communication

Supervisor's Photo:

Researcher's Name: **Dr Mohammad Hamiduzzaman**
Researcher's Email:
mohammad.hamiduzzaman@flinders.edu.au

Research Group Name: Rural and Remote Health SA
Location of Project: South Australia

Research Image:



Brief Outline of Project:
Exploring the Clinical Interaction Experiences of Rural Older South Australians: A Multi-Healthcare Setting, Mixed-Method Study

The quality of clinical interactions between practitioners and elderly patients is increasingly being recognised as an indispensable part of effective aged care. Some of the benefits attributed to person-centred clinical interactions are enhanced information exchange, shared decision making, patient's understanding of care, empowerment and satisfaction and development of reliable relationships between clinicians and patients. This study aims to assess the quality of clinician-elderly patient's interactions, and also to explore the factors and issues that impact on the personal-centred clinical interactions. A mixed-methods study involving a short demographic survey, self-assessed quality of interactions and qualitative interviews with rural elderly people will be conducted in multi-healthcare settings in Rural South Australia. A questionnaire on the quality of physician-patient interaction (QQPPI), as a self-report questionnaire, developed by Beiber et al. (2010) will be used to understand the quality of interactions. And the semi-structured questionnaire will be designed to capture the challenges experienced by the participants in the clinical interactions when they visited clinics and or hospitals. Quantitative data will be analysed using SPSS and Qualitative data will be analysed thematically using NVivo. The data from this study will inform the clinicians about how to design the questions to elicit information regarding patients' needs and preferences, and encourage patients to ask questions about their diseases, treatment options and medications.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/mohammad.hamiduzzaman

Other Honours Projects available in 2020

Project Subject Area(s):- Evaluating multidisciplinary team-based care for cancer patients

Supervisor's Photo:

Researcher's Name: **Laura Edney**
Co-supervisor: **Professor Jonathan Karnon**
Researcher's Email: laura.edney@flinders.edu.au

Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Research Image:

Brief Outline of Project:

Multidisciplinary team meetings (MDTMs) are an integrated team approach to planning treatment and care for individual patients and are a common care paradigm used in oncology. In Australia, multidisciplinary care is considered 'best practice in the treatment planning and care for patients with cancer' and MDTMs form a key part of national and state-wide cancer control plans to optimise treatment and autonomy for patients. However, evidence of the clinical effectiveness of MDTMs in improving outcomes for patients is limited and many studies have only examined intermediate measures, such as changes to treatment recommendations rather than assessing patient outcomes such as survival. Furthermore, they require significant time and resource investment from both the health system and clinicians, with one estimate for the UK estimated the cost of personnel attending oncology MDTMs as approximately £150 million (AU$276 million) annually.

MDTMs are an expensive service to provide. If they do not improve patient outcomes, then the investment might be better spent in other areas that have demonstrated improvements in health outcomes.

The aims of this project are to evaluate the use of MDTMs in oncology care. This could involve one or more of the following activities: estimating the costs of running MDTMs in oncology care, describing patterns of health care, costs and outcomes for oncology patients discussed at an MDTM compared to those not discussed at a MDTM and interviewing or surveying clinicians on their preferences for how MDTMs are run and how they prioritise their patients for discussion at a MDTM.

It is expected that the results of this project will be presented locally to participating hospitals, health networks and cancer organisations.

Link to more information about researcher or research group:

https://www.flinders.edu.au/people/laura.edney
https://www.flinders.edu.au/people/jonathan.karnon

Project Subject Area(s): Decision analytic quality improvement

Supervisor's Photo:

Researcher's Name: **Professor Jonathan Karnon**
Researcher's Email: jonathan.karnon@flinders.edu.au
Co-supervisor: **Andrew Partington**
Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Research Image:

Brief Outline of Project:

Quality Improvement is a common activity in hospitals. Often a QI project is initiated in response to an observed issue regarding the performance of a particular clinical unit, for example, patients may be observed to have a longer length of stay than at other, similar hospitals.

Established methods for QI projects involve the group-based development of care pathways, which may be informed by an audit of clinical records. Various brainstorming approaches can then be used to identify critical components of the care pathway, i.e., the components that may be contributing to the observed issue that precipitated the QI project. Options to improve identified components can then be proposed and potential solutions implemented, and evaluated to determine whether quality improves.

Decision analysis involves the analysis of a quantifiable model structure that represents the relevant components of the problem. The traditional QI tasks of describing care pathways and auditing clinical records to identify common care pathways are similar to the initial phases of a decision analytic process. However, a decision analytic approach also involves the quantitative analysis of the developed model to identify critical components of the care pathway, as well as to test the effects of potential solutions.

The project will involve working with staff in a clinical unit at Flinders Medical Centre, drawing on and extending their QI methodology to apply a decision analytic framework to their QI project. Interaction and engagement with clinical unit staff will be essential to inform and support the acceptability of the decision analytic approach.

A decision analytic model for the QI project will be developed with clinical unit staff, describing current care pathways and decision points for the relevant patient population. Data to populate the decision analytic framework will be collected. Data sources include local hospital data, state or Commonwealth data sources, e.g., registries, published data and the opinions of local stakeholders, e.g., clinicians and patients.

The decision analytic model will be validated and analysed and the results presented to staff in the clinical unit to inform the assessment of care pathways and the selection of options to improve performance.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/jonathan.karnon

Project Subject Area(s): Local Health Technology Assessment (HTA)

Supervisor's Photo:

Researcher's Name: **Professor Jonathan Karnon**
Researcher's Email: jonathan.karnon@flinders.edu.au
Co-supervisor: **Andrew Partington**
Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Research Image:

Brief Outline of Project:

Evidence is continually being generated on the effects of new treatments (e.g., new pharmaceuticals), but also on approaches to organising the delivery of health care (i.e., alternative health care delivery models). We identified over 600 Australian evaluations of health care delivery models that have been published in the last 10 years. The government cannot fund all forms of health care. Decisions must be made about what health care is funded.

Health Technology Assessment (HTA) compares the costs and benefits of alternative approaches to providing care for specific patient populations. In Australia, there are well established, formal processes for using HTA to inform decisions about whether to fund new pharmaceuticals. Decisions to fund the implementation of new health care delivery models are less well organised because these decisions are made at a more local level, e.g., by Local Hospital Networks (LHNs). LHNs do not have sufficient capacity to systematically assess the value of new health care delivery models in the local setting to inform decisions about whether a LHN should fund new health care delivery models.

The aim of this study is to undertake a Local HTA of a specific health care delivery model from the local perspective of the Southern Adelaide LHN.

A decision analytic model for the Local HTA of the selected health care delivery model will be developed, describing current care pathways for the relevant patient population. The decision analytic model provides a framework for synthesising data to estimate the costs and outcomes associated with alternative approaches to caring for defined patient populations.

Data to populate the decision analytic framework will be collected. Data sources include local hospital data, state or Commonwealth data sources, e.g., registries, published data and the opinions of local stakeholders, e.g., clinicians and patients.

The decision analytic model will be validated and analysed and the results presented to relevant SALHN staff and the value of the Local HTA to inform local decisions will be assessed.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/jonathan.karnon

Project Subject Area(s): Health Economics (Health Technology Assessment: HTA)

Supervisor's Photo:

Researcher's Name: **A/Prof Hossein Afzali**
Co-supervisor: **Dr Laura Edney**
Researcher's Email: hossein.afzali@flinders.edu.au Click here to enter text.

Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Brief Outline of Project:

Project Title
Comparing methods of health technology assessment in Australia: MSAC and PBAC

Health technology assessment (HTA) is the systematic evaluation of health technologies (e.g. pharmaceuticals, medical devices) in order to inform funding decisions and clinical practice. In Australia, public funding decisions for new health technologies are made by two key funding bodies: (1) The Pharmaceutical Benefits Advisory Committee (PBAC) provides advice to the Australian Government on whether a new pharmaceutical/vaccine should be publicly funded; (2) The Medical Services Advisory Committee (MSAC) whose role is to advise the Australian Government on whether a new medical service/device/procedure should be publicly funded.

Differences in the HTA methods and processes for evaluating new technologies by these two committees and how these may impact on healthcare efficiency and resource allocation have not previously been systematically investigated. This project aims to address this issue.

This project will involve reviewing MSAC and PBAC technical guidelines and extracting key information such as remit and scope, process of assessment, methods of evaluation and appraisal of evidence into a database. Comparison of the similarities and differences between methods used can then be detailed. Any differences identified will be further explored with MSAC and PBAC members via survey or interview methodology. Data sources will include MSAC and PBAC websites, and personal interviews/survey

The project requires some experience with extracting information from websites and interest in survey design or interview

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/hossein.afzali

Project Subject Area(s): Health Economics

Supervisor's Photo:

Researcher's Name: **A/Prof Hossein Afzali**
Co-supervisor: **Dr Laura Edney**
Researcher's Email: hossein.afzali@flinders.edu.au

Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Brief Outline of Project:

Project Title:
Healthcare spending and population health: Panel data evidence from Australia

Given the importance of population health and its contribution to the economy, it is critical for all countries to invest in their health care system. Government healthcare expenditure aims to improve health outcomes and reduce inequity through the provision and allocation of health technologies (e.g. pharmaceuticals, medical devices) and services. Increased healthcare expenditure should, all else being equal, translate to improved health outcomes. However, the empirical relationship between healthcare expenditure and population health is not well understood in Australia.

This project aims to investigate the relationship between healthcare expenditure and population health.

This project will involve reviewing empirical studies on the relationship between health outcomes and health care spending. Then, the project will use publicly available national data sources to establish a panel dataset across several years by States and Territories, including information on healthcare expenditure, healthcare outcomes (e.g. mortality) and additional covariates such as government spending in other areas, population size, lifestyle factors such as alcohol and cigarette consumption and health status variables such as diabetes prevalence. A panel data analysis will be used to determine the effects of healthcare expenditure on health outcomes.

The project requires some experience with collating data from websites and interest in quantitative studies.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/hossein.afzali

Project Subject Area(s):- Evaluating models of supportive care for cancer patients

Supervisor's Photo:

Researcher's Name: **Laura Edney**
Co-supervisor: **Professor Jonathan Karnon**
Researcher's Email: laura.edney@flinders.edu.au

Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Brief Outline of Project:

Oncology patients require ongoing medical and supportive care. There is a lot of descriptive evidence on what unmet supportive care needs cancer patients have (such as psychosocial or pain management needs), but much less evidence on how to address these. We have identified a range of interventions from the literature that improve the supportive care needs of cancer patients. However, simply identifying these does not result in their implementation. Evidence-based interventions may be unable to be implemented in particular settings (e.g. due to resource constraints such as staff) or they may not result in improvements if there is low patient uptake (e.g. low patient need, other preferences etc).

The aims of this project are to develop an implementation framework to adapt evidence-based interventions to improve the supportive care needs to the local context. This could involve a range of activities including documenting current supportive care need services provided across the Southern Adelaide Local Health Network, documenting how the need for these services is currently identified and prioritised and assessing patient preferences for how these services should be delivered.

It is expected that the results of this project will be presented to locally to participating hospitals, health networks and cancer organisations.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/laura.edney
https://www.flinders.edu.au/people/jonathan.karnon

College of Medicine
& Public Health

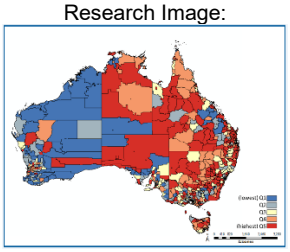
Project Subject Area(s):- Exploring unmet clinical needs

Supervisor's Photo:

Researcher's Name: **Laura Edney**
Co-supervisor: **Professor Jonathan Karnon**
Researcher's Email: laura.edney@flinders.edu.au

Research Group Name: Health Economics
Location of Project: Flinders University and FMC

Research Image:



Brief Outline of Project:

The public healthcare budget will never be large enough to meet all the clinical needs of the population. Describing the extent and distribution of unmet need is important to allow policymakers to make informed decisions about where to allocate our scarce resources. For example, should we spend $10 million on a new cancer drug or should we reduce waiting lists for joint replacements or cataract operations?

The aim of this project is to explore unmet clinical need in Australia. The focus of the project may be broad (e.g. looking at unmet need across diseases or conditions across the healthcare system) or narrow (e.g. focussing on issues around unmet need for a particular disease or condition in a particular jurisdiction) and can be further refined depending on student interests. This could include a systematic review on unmet need, analysing existing survey or administrative datasets to assess variation in health care use or interviewing or surveying stakeholders (e.g. GPs, hospital-based clinicians, managers, consumers, politicians) to understand barriers and facilitators to reducing unmet need (e.g. workforce and other capacity constraints, organisation and political issues).

The results will be presented to health professionals and policymakers at local and/or national forums.

Link to more information about researcher or research group:
https://www.flinders.edu.au/people/laura.edney
https://www.flinders.edu.au/people/jonathan.karnon