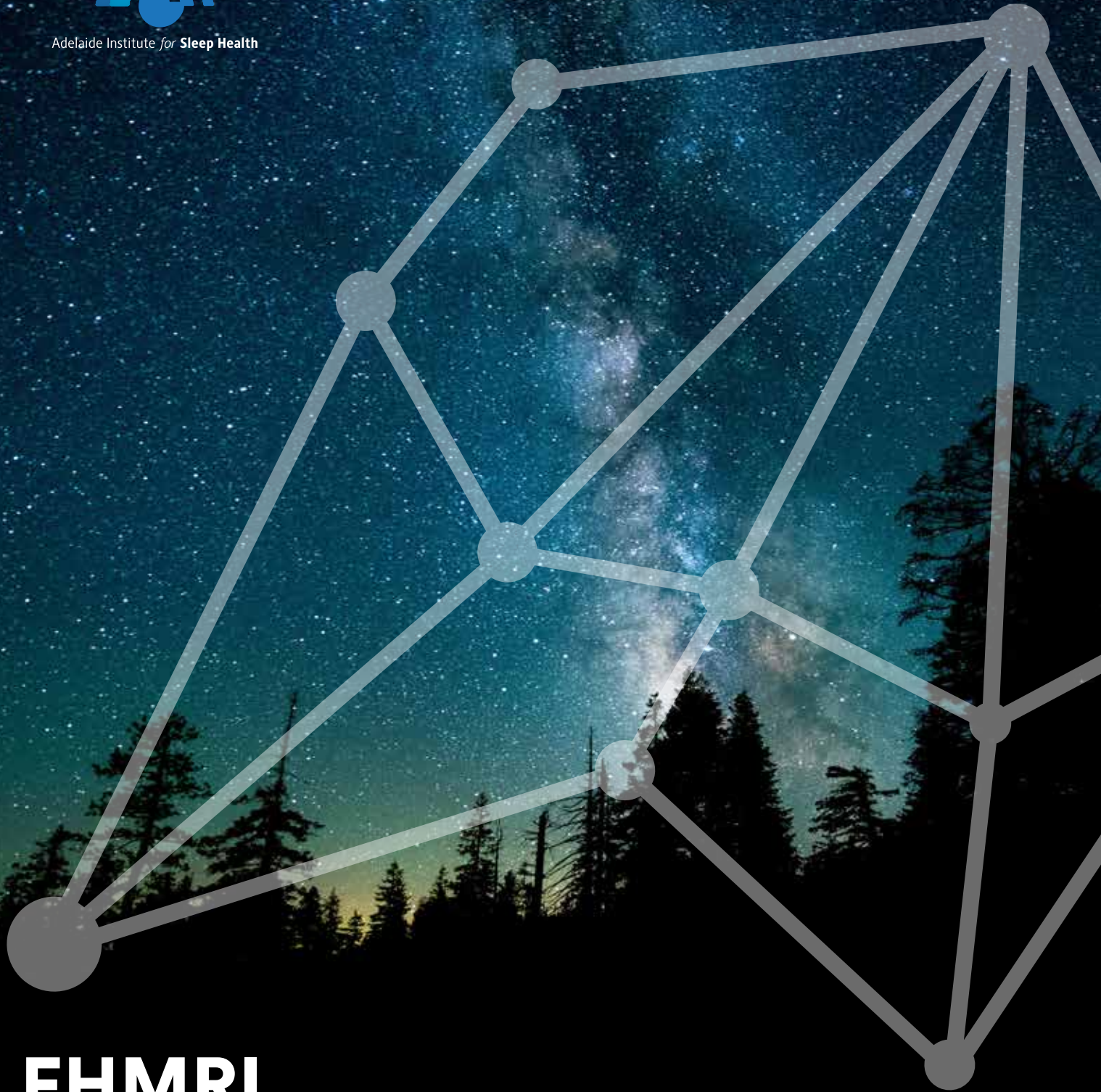




Adelaide Institute for Sleep Health



FHMRI **Sleep Health**

Annual Review 2022



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Our purpose

Improve lives through the science of sleep.

Our mission at FHMRI Sleep Health is to reduce the burden of sleep disorders and improve peoples quality of life through our research and advocacy work in sleep health.

About us

We are passionate about our role as a leading research group in Australia for sleep disorders.

Our mission gives us a clear focus on improving the health and lives of the estimated “four in every ten adult Australians regularly experiencing inadequate sleep” (Deloitte, 2017, p.1).

Reference: Deloitte Access Economics (Deloitte), Exhibit 2b: Asleep on the Job: Costs of Inadequate Sleep in Australia, 2017, p. i.

Message from the director

Oct 5th, 2022

The last 12 months has delivered a new set of challenges and opportunities as we continue to respond to the COVID-19 pandemic and its impact on our people and operations. Despite the obvious challenges, our team has once again managed to adapt and deliver a highly productive sleep health research program including the use of innovative approaches to in-home monitoring and diagnostics.

This annual review provides a high-level overview on current research grants, activities, recent achievements, and a look to the future regarding new studies, collaborations, challenges, and opportunities.

The development of personalised sleep health, combined with improved diagnosis and treatment pathways, will be key drivers toward our purpose – Improving lives through the science of sleep. We have identified six key themes to address the associated challenges and opportunities, which collectively underpin our work; Sleep apnoea and respiratory physiology, Insomnia, Shift work and circadian disruption, wearable and nearable technology, Sleep neuroscience and biomarkers, Health services and epidemiology and population health.

We have continued our position as a key national research centre for sleep disorders in Australia and continue our work on several >\$1Million NHMRC and Government funded research projects along with several large industry funded studies. However, along with the COVID-19 associated challenges, the competition for NHMRC research grant funding has continued to increase in recent years and we envisage that this will continue in the near future. Despite this, our work over the past 12 months including our continuing strategic efforts to clearly define our key purpose, vision, strengths and identify areas of opportunity should lay the foundations to ensure our continued successes over the years to come.



Professor Danny Eckert, Director FHMRI Sleep Health

Even amid recent uncertainty, we have continued to grow a strong, multi-disciplinary group of talented colleagues and students (now >60 personnel) who continue to produce cutting-edge, impactful sleep science and achieve funding successes to support our research agenda. In recent months, members of our team have been able to resume conference travel and present their work on the international stage and benefit from the associated interactions and collaborations with external colleagues. The achievements of the team have been acknowledged with several external awards for their work and contributions to the field for which we are of course all very proud. Because of this, we have been able to quickly innovate and adapt to redefine the way we work and, in many ways, this has brought our team even closer together. Thus, we have once again been able to draw many positives and new opportunities from our experiences over the past year that we can take with us moving forward.

With this in mind, it remains an exciting time for FHMRI Sleep Health/AISH to be charting the next steps of its future.

Thank you all for your ongoing support,

Professor Danny Eckert

Matthew Flinders Professor
Director, FHMRI Sleep Health/ Adelaide Institute for Sleep Health (AISH)
College Medicine and Public Health

FHMRI Sleep Health Impact 2022

Building global knowledge

39

Research projects

(Active Sept 2021 to Aug 2022)

12

Clinical Trials

(Sept 2021 to Aug 2022)

427

In-Lab sleep studies

(Sept 2021 to Aug 2022)

110

Publications

(Sept 2021 to Aug 2022
Data source: Pure, Flinders University)

Collaboration

Between 2019 and 2022, FHMRI Sleep Health researchers collaborated with more than 200 researchers from different research units in Australia and around the world

(Data source: Research @ Flinders, Powered by Pure, Scopus & Elsevier Fingerprint Engine™)



Grant Support

Grant funding

(Active Sept 2021 to Aug 2022)

\$15.1
million

Research grants:

- 3 NHMRC (multi-year, >1M)
- 5 NHMRC (multi-year, <1M)
- 1 Other External (Single or multiyear, >\$1M)
- 22 Other external (Single or multiyear, <\$1M)
- 8 Internal grant schemes (Single year, \$10K - \$175K)

Number commencing 2022: 12 (\$3.5M)

FHMRI Sleep Health Strategy

Improving lives through the science of sleep

Reduce the burden of sleep disorders and improve peoples quality of life through our research and advocacy in sleep health

Sleep apnoea and respiratory physiology

Redefining and improving sleep disordered breathing diagnosis

Novel and improved effective personalised treatment options

Insomnia, shift work and circadian disruption

Improving knowledge of human circadian and sleep mechanisms

Design and develop effective translational treatments in; insomnia, shift work disorder, circadian disruption

Novel use of digital innovations and technology

Redefining and improving sleep disorders diagnostics

Novel and improved decision support tools and devices for personalised treatment options

Sleep neuroscience and biomarkers

Identifying & refining use of at-risk biomarkers of sleep disorders

Program development to address impact of day-time sleepiness

Health services

Refining treatment pathways

Advocacy and policy briefing

Professional training

Clinical services

Epidemiology and population health

Hypothesis origination

Special population studies

Advocacy

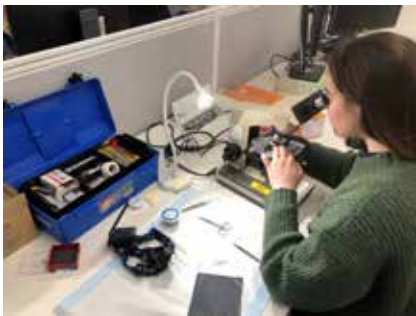
Consumer education



Sleep apnoea and respiratory physiology

Development of new pharmacotherapies for sleep apnoea

Currently, there are no approved pharmacotherapies to treat obstructive sleep apnoea (OSA). However, with recent advances in knowledge of OSA pathophysiology, there are now several lines of investigation into novel pharmacotherapy agents and repurposing existing medications to activate the upper airway muscles during sleep and stabilise respiratory control instability to reduce OSA severity.



Georgina Rawson, Research Assistant making genioglossus EMG wires for the detailed sleep physiology studies

The FHMRI Sleep Health team has been at the forefront of these innovations that have the potential to realign the therapeutic agenda for this common, chronic respiratory disorder. This year alone we have led three separate, multi-centre drug repurposing studies with collaborators in Sydney aimed at reducing OSA severity.

We are also currently undertaking two phase one trials with industry partners investigating novel pharmacotherapy targets to treat OSA. Finally, along with collaborators in Sydney, we are one of two Australian sites that are about to commence a world-wide multicentre trial aimed at pharmacologically reducing body weight in obese people to treat OSA.

Developing non-invasive measurement of respiratory muscles

The respiratory muscles are activated over 20,000 times a day to ventilate the lungs. In health, the efficiency of lung ventilation is maximised as respiratory muscle activity is matched to the ability of the muscles to draw air into the lungs (i.e. muscle mechanics).

However, measurements of muscle activity and mechanics rely on invasive and expensive techniques

that limit testing in vulnerable populations. Our current research is developing non-invasive methods to assess muscle activity and muscle mechanics, which we will then apply to define inefficient breathing in lung disease. Alongside this, we are investigating how neural control of breathing is altered in lung disease and the link with 'dyspnoea', the sensation of breathlessness, which is a common and disabling symptom of lung disease.



Senior Research Fellow Anna Hudson

Low dose morphine to reduce breathlessness- the role of sleep

In collaboration with our palliative care colleagues in Sydney and their international network, we have led several projects into the potential mechanistic role of improved sleep with low dose morphine to reduce breathlessness in people with COPD and chronic refractory breathlessness. Contrary to previous beliefs, we have found no evidence that low dose morphine causes next day somnolence. Rather, in many people, low dose morphine was actually associated with improved perceived sleep quality and next day function. This has culminated in a single site, AISH-led randomised, placebo-controlled, cross-over trial in which 20 people with COPD

and breathlessness receive 3 days of 20mg of kapanol and placebo (1 week wash out in between interventions).

This detailed physiology study captures a range of measures including objective sleep measures (in-home and in-lab), blood morphine concentration, genetic analyses, next day driving simulator performance, and experimentally induced breathlessness assessments across conditions. This study, which is reaching completion, will provide new insight into the inter-individual differences in the clinical responses to reductions in breathlessness with low dose

The role of impaired pharyngeal muscle control in the pathogenesis of obstructive sleep apnoea in non-obese people with multiple sclerosis (MS)

Supported by a Flinders Foundation seed grant and in collaboration with SALHN clinical collaborators in neurology and radiology, we are halfway through a detailed physiology study aimed at investigating whether impaired pharyngeal reflex muscle control, via MS related brainstem lesions, is a novel pathophysiological mechanism that drives OSA in certain non-obese people with MS. This new program of work may yield new therapeutic targets for this cohort of patients in whom sleep disorders are very common and traditional therapies (i.e., CPAP to treat OSA) are often particularly poorly tolerated. The mechanistic knowledge gained in this patient population also has the potential to shed new light on OSA the multifactorial nature of OSA pathogenesis more broadly.



Dr Thomas Altree, clinician and PhD candidate at FHMRI Sleep Health accepting the 2021 Thoracic Society of Australia and New Zealand (TSANZ) New Investigator Award for his work on reboxetine for sleep apnoea pharmacotherapy.



Professor Danny Eckert, Matthew Flinders Professor and Director of FHMRI Sleep Health was awarded the Meier-Ewert Prize for outstanding contributions to sleep medicine, by the German Society of Dental Sleep Medicine at an award ceremony at the opera house (Alte Oper) in Frankfurt, Germany in Germany, September 2022.

A new ICU breathing effort analyser

FHMRI Sleep Health researchers have developed an advanced new method for assessing breathing effort during sleep now being adapted to comprehensively assess patient-ventilator asynchrony in intensive care units (ICUs).

Patient-ventilator asynchrony occurs when machine-assisted breaths are mistimed to patient breaths. This is thought to contribute to lung injury, difficulty with patients getting off the ventilator, longer ICU and hospital stay and potentially avoidable deaths in ICU. Asynchrony cannot reliably be detected or assessed from conventional ventilator signals alone. The new AISH technique uses airflow, pressure and oesophageal balloon measurements in combination with advanced signal processing to calculate and display when and how much flow and volume the patient contributes to each breath separate from that of the ventilator.

This could free clinicians and nursing staff from the major underlying complexities of breathing mechanics to clearly display and measure patient-ventilator asynchrony breath-by-breath. Incorporation of this new method into future smarter ventilator devices could help to avoid asynchrony. Application of the same method in sleep studies can provide very detailed assessments of breathing effort compared to achieved ventilation to help better understand a range of breathing problems in sleep such as obstructive sleep apnoea (OSA), obesity hypoventilation and respiratory failure more generally, and the overlap between OSA and chronic obstructive pulmonary disease (COPD).

Women in Science

Dr Amal Osman



Research Fellow, FHMRI Sleep Health

Winner of the 2021 Emerging Innovator Winnovation SA award, IN Daily South Australia 40 under 40 awards and recognised in the SkyCity, Advertiser and Sunday Mail's SA's Woman of the Year 2022 Award for innovation.

Dr Amal Osman has developed simple clinical tools to measure upper airway collapsibility in people with obstructive sleep apnoea. These tools help us understand the mechanisms that contribute to airway closure in sleep apnoea and may predict therapeutic outcomes to targeted and novel OSA treatments.

Insomnia, shift work and circadian disruption

Examining health outcomes for young shift workers with sleep disorders

Shift work and sleep disorders are both associated with adverse mental health outcomes; but the combination of both factors is rarely considered in young workers.

Our recent work with the unique Raine Study cohort has demonstrated that sleep disorders which are predominantly undiagnosed are associated with adverse mental health outcomes, even early in working life. When a young worker (22 years old) is engaged in evening and/or night shift work and is living with a sleep disorder, the impacts on anxiety symptoms are significantly worse. Our work highlights a need to better identify sleep disorders in young workers, as a potentially targetable intervention strategy for improving young adult mental health. This appears to be particularly important for young shift workers who need to work at times of day when they should be sleeping.



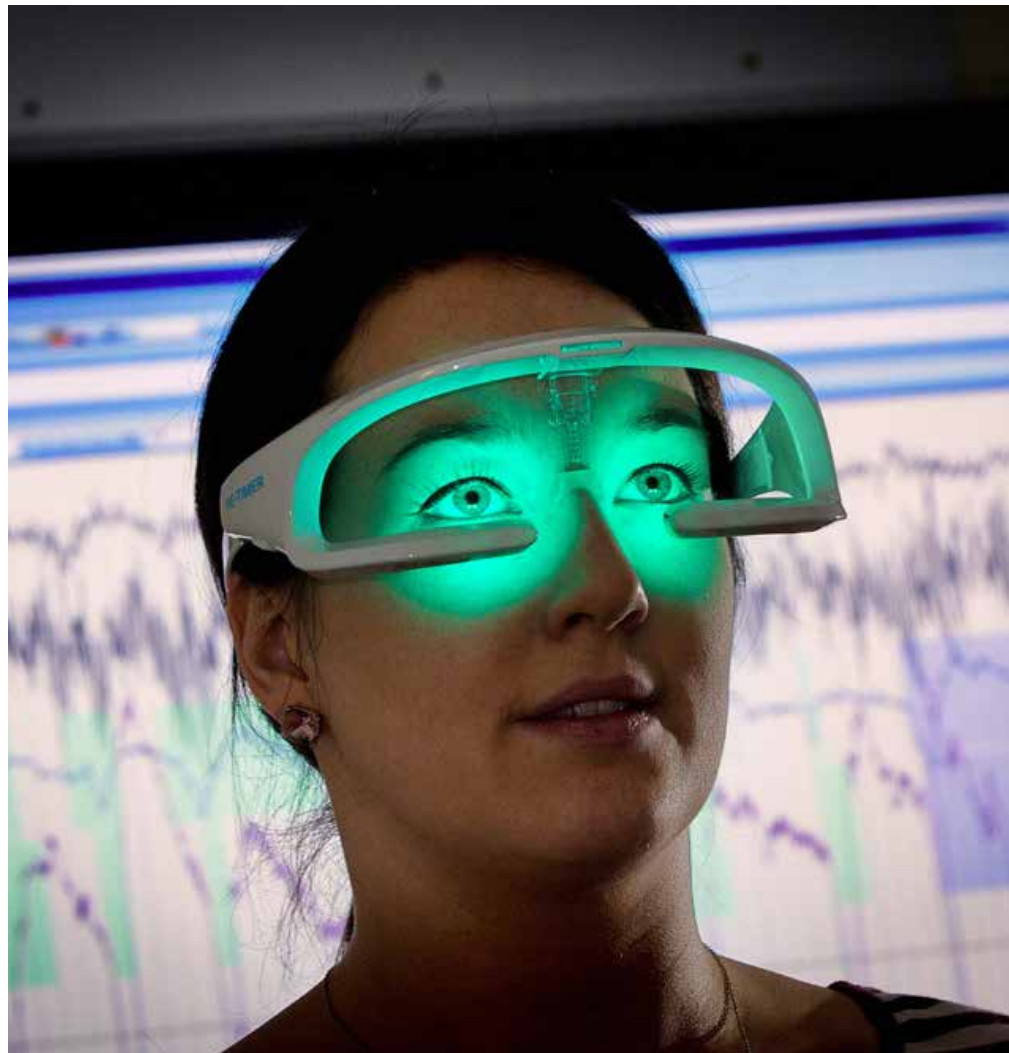
Research Fellow Dr Gorica Micic applying EEG leads to a patient for an overnight study

Improving sleep for shift workers

Shift work is an intrinsic component of work as a paramedic. This can put pressure on worker sleep opportunity and health, even in healthy workers with no pre-existing sleep disorders. However, we know that 20% of young workers live with a clinically significant sleep disorder - most of which are undiagnosed and untreated.

Our current trial involves 30 young paramedic students who underwent sleep disorder screening and consultation with our sleep physician to ensure referral to a relevant sleep treatment pathway per typical Australian referral pathways. This study is designed to better understand how we can encourage sleep disorder screening and treatment early for young workers, before they are also exposed to the disruptions associated with shift work. We hope to better clarify the best pathways to improve sleep disorder diagnosis and management in young adults, and ensure they start their shift work careers with the best possible sleep profile.

Photo; ReTimer Glasses





Professor Peter Catchside and Research Associate Hannah Scott discussing data from a core body temperature pill.

Sleep-wake cycles and core body temperature machine learning

Core body temperature has profound effects on biochemical reaction rates and cell viability and is one of the most important vital signs indicative of human health.

Normal core temperature cycles vary from around 36.5 C, typically around 5 am, up to a maximum of around 37.5 C in the late afternoon reflecting circadian regulation of metabolism throughout all cells within the human body. Circadian misalignment between the normal day-night and sleep-wake cycles underlies a major class of sleep problems that negatively impact on wake function and health, through inadequate sleep and circadian dysregulation effects.

The FHMRI Sleep Health team are currently developing and testing physiology- and machine-learning informed analysis methods to infer core temperature from wearable sensor data. This approach could avoid the need for direct and costly core body temperature assessments to support daily monitoring and management of circadian timing problems. The ability to continuously track the constantly changing core body temperature “baseline” could also lead to better methods for continuous monitoring for early-detection of abnormal body temperature (e.g. infection and fevers), and support better circadian-informed drug-therapy timing.

The mortality risk of insomnia in older adults

Prior research has found mixed findings on the potential link between insomnia and mortality risk. The current study examined the association between insomnia severity and all-cause mortality in older adults (≥65 years), distinguishing between nocturnal and daytime symptoms.

Data from 1,969 older adults who participated in the first wave of the Australian Longitudinal Study of Ageing (ALSA) were analysed. The findings indicate that increased mortality risk associated with insomnia may be almost entirely driven by the presence of daytime symptoms, with no association found between night-time symptoms and mortality risk. This suggests that daytime impairment, which may or may not be directly attributable to insomnia, increases mortality risk. Additionally, the presence of night-time symptoms without daytime symptoms should not cause for alarm, at least from the perspective of mortality risk.



One of six ensuite bedroom facilities in the FHMRI Sleep Health Nick Antic Sleep Laboratory (photo courtesy of Cheeseman Architects).



Assoc. Prof Anjum Naweed, CQU Appleton Institute alongside Snr. Research Fellow Amy Reynolds, and PhD candidates Brandon Brown and Sian Wanstall, FHMRI Sleep Health received Safework SA's 2022 Augusta Zadow Award, during the ceremony held at Government House, Adelaide.

Women in Science

Dr Amy Reynolds



Senior Research Fellow, FHMRI Sleep Health, Flinders University

“My background is in Psychology – I did my undergraduate and Honours, before starting my PhD at UniSA back in 2010. I hadn’t planned at all to do sleep – but fell into paediatric sleep for my Honours, before moving into sleep restriction studies for my PhD. I spent some time in WA (including working on the Raine Study) while finishing my PhD, before coming back to Adelaide in 2015 to work at the Appleton Institute (CQUniversity). Since then I’ve also completed a Master of Science in Medicine (Clinical Epidemiology) and I love using population data to answer questions. I’ve been at FHMRI Sleep Health for 2 years now and absolutely love it here.”

My research focusses on sleep, health and safety in occupational contexts – particularly shift work. I am particularly passionate about improving management of sleep disorders for shift workers. The combination of both shift work and a sleep disorder can be a big problem for worker health and safety but is poorly recognised by workers and many are undiagnosed, or undertreated. I love working with organisations, clinicians and most importantly the workers themselves, to try and find solutions.

Our team is working hard to better understand what we can do to improve sleep disorder education and early intervention for workers who are either already working shifts or may be about to start a career which requires shift work. We know that 20% of young Australian adults start their working lives with a (commonly undiagnosed) sleep disorder, and we want to change this! We are very fortunate to have funding from Safework SA’s Augusta Zadow Award in 2022 to look at experiences of Australian paramedics with sleep, fatigue and sleep disorders. This work will help us to directly inform education and occupational strategies to support paramedics with managing sleep problems and fatigue. We are also running a first of kind early intervention trial to improve sleep disorder diagnosis and management in paramedic students before they start their careers to improve the transition to shift work and wellbeing.

It is my hope our research will shift the focus to early identification and management of sleep disorders in shift workers and encourage new strategies with employers which promote support for diagnosis and treatment.”

Translating sleep science: FHMRI Sleep Health Clinic



Photo by Anthony Tran on unsplash

FHMRI: Sleep Health (formerly Adelaide Institute for Sleep Health, AISH) is dedicated to translating the science of sleep to deliver evidence-based treatments for the general community that are proven to improve sleep, health and wellbeing.

The combination of the latest research and technology enables us to provide evidence-based treatment via the Insomnia Treatment Program.

Our team of psychologists and physicians below also support the training of students who are undertaking a postgraduate clinical degree.

Cognitive Behaviour Therapy for Insomnia (CBTi)

The Insomnia Treatment Program, a non-drug treatment for sleep is based on Cognitive Behavioural Therapy for Insomnia, started in 1992 at the Repatriation General Hospital under the guidance of Professor Leon Lack. Over 1000 patients with insomnia and other sleeping problems have been successfully treated in this previous clinic.

This service is now offered via the FHMRI Sleep Health Clinic and is set up to treat and assist people who may be experiencing insomnia, circadian rhythm sleep disorders and/or sleep-related mental health disorders.

Further information about the clinic is available on our website: www.flinders.edu.au/health-medical-research-institute/clinical-translation/sleep-health/sleep-health-treatment

Novel use of digital innovations and technology development

Intensive Sleep Retraining: Capable of treating insomnia in a single session

Chronic insomnia is a highly prevalent sleep disorder for which our gold-standard intervention, cognitive behavioural therapy for insomnia, is only implemented for <1% of patients.

Given the ubiquity of sleep monitoring technologies, our current research has focused on using wearable trackers to support the treatment of insomnia. One such research project involves testing a novel smart ring called THIM that we have designed to administer a traditionally laboratory-based treatment for insomnia. The treatment is called Intensive Sleep Retraining and is capable of treating insomnia in a single session, with the benefits realised in just 24 hours. This research program will help improve the accessibility of treatments for insomnia by supporting patients to self-implement efficacious therapies with the assistance of sleep technology in their own homes.



Dr Hannah Scott checking the THIM Intensive Sleep Retraining program.

Noise and sleep

Advanced signal processing methods developed for this project hold significant promise for providing improved and more sensitive assessments of sleep disruption with noise and in clinical sleep problems more generally.

A range of findings have been reported from an extensive study into environmental noise impacts on sleep. 68 volunteers spent 7 nights in the AISH sleep laboratory during which a range of noise conditions were studied, including one night to get used to the laboratory, followed in random order by a range of nights with and without windfarm and road traffic noise played at different levels. Study participants also completed a range of questionnaires, a hearing test, daytime listening tests and underwent saliva sampling for cortisol (a stress hormone) measurements. Not all analysis is

fully complete, but study findings published to date show some but relatively small and short-lasting effects of noise on sleep when noises commence during sleep, but with no or relatively small effects on sleep overall. However, the advanced signal processing methods developed for this project hold significant promise for providing improved and more sensitive assessments of sleep disruption with noise and in clinical sleep problems more generally.



Windfarm Field trip

Superior sleep signals from Tri-concentric ring electrodes (TCRE)

AISH researchers recently completed a study in 20 healthy volunteers to compare TCRE versus conventional EEG signals recorded during sleep.

Tri-concentric ring electrodes (TCREs) measure current density underlying each electrode, rather than the more conventional voltage difference between two distant electrodes. When used for scalp

recordings, this provides more focal measures of brain activity with much less interference from muscle activity compared to conventional electroencephalography (EEG) recordings. Analysis to date supports superior signal:noise and more focal measurements with TCRE versus conventional EEG. Ongoing analysis will compare TCRE signals with conventionally scored EEG across different sleep stages and recording sites and test a range of signal processing methods for sleep assessment using TCREs.



Withings under mattress sensor mat

New in-home sleep monitoring systems could assist in sleep disorder diagnosis

FHMRI Sleep Health researchers examined night-to-night variability in under-mattress device measures of body movements, breathing, heart rate and snoring to estimate sleep time and overnight breathing disturbances.

Through an industry collaboration with Withings, data from over 67,000 individuals each with around 170 nights of recordings found that multi-night in-home monitoring can be very useful to help detect and monitor treatment outcomes for very common sleep problems such as obstructive sleep apnoea (OSA), and potentially other sleep-related disorders. Device measures also indicate a high global prevalence of moderate to severe OSA of around 20%, and that substantial night-to-night variability in sleep measures may lead to around 20% of individuals being misclassified as having or not having OSA from single-night sleep study assessments. An ongoing study is now evaluating the potential use of multi-night measurements in combination with more detailed sleep study measurements to improve clinical outcomes for patients undergoing assessment and treatment for suspected OSA.

Women in Science

Dr Hannah Scott



Research Associate, FHMRI Sleep Health, Flinders University

“With new technologies rapidly emerging that can estimate your sleep such as wearables and “nearables” (devices placed near the body), it is an exciting time to be in the field of sleep research. A key focus of my research as a FHMRI Sleep Health post-doctoral researcher is developing these emerging technologies and using them to better diagnose and treat sleep disorders.

We have developed a new sleep tracker called Thim to implement a treatment for insomnia in the home environment that works in just 24 hours. At present, I am leading a clinical trial to test how well Thim treats insomnia compared to other digital therapeutic approaches. This research will help clinicians and patients with insomnia make better informed choices about which digital therapy they should use to treat insomnia: a condition that affects ~2.8 million Australians.

Insomnia is a highly debilitating condition that can impair quality of life for decades. I am driven to improve our management of insomnia by using sleep technologies to improve our diagnostic practices and to implement exciting new therapies in the home. In the future, my hope is that we can use emerging sleep technologies to not only improve sleep disorder management practices but also to increase accessibility to sleep disorder services, especially for communities with limited access to existing sleep health services.”



The Hon. Stephen Wade, Professor Doug McEvoy, President and Vice Chancellor Colin Stirling and Deputy Vice chancellor Professor Colin Stirling discussing research involving driver simulation at the AISH official opening, 2019.

Sleep neuroscience and biomarkers

Predicting driver impairment

Poor sleep and sleep disorders are essential contributors to driver fatigue and road accidents.

Obstructive sleep apnoea is related to an increased risk of driving impairment and accident risk but identifying drivers with sleep apnoea who are impaired on the road is a daily clinical challenge.

A recently completed NHMRC study has investigated novel neurophysiological, biological, and behavioural biomarkers to help better identify at-risk drivers with OSA.

Detailed analysis of brain wave activity during sleep and wake, blood and saliva samples, and neurobehavioral performance data is currently being analysed to establish and validate the best clinically deployable biomarkers to predict driving impairment.

The findings from this study are expected to change clinical practice in how fitness to drive is assessed in people with sleep apnoea.



Carolyn Tran, Laboratory Manager testing the new driver simulator unit installed March 2022.



Monitoring eye movement with VCR headset

Are you driving whilst sleepy? On-road driver sleepiness testing

Although we have an established roadside method for detecting blood alcohol levels in drivers, there are no roadside tests for sleepiness.

A current study tests the sensitivity and utility of vestibular ocular measures (eye movements) trial using virtual reality technology to identify sleepy drivers. The study employs a sleep deprivation protocol where healthy and sleep-disordered participants undergo a series of a driving simulator and cognitive assessments in parallel with eye movement tests to determine if such technology can identify key features of driver drowsiness and fatigue while driving. If the study results are positive, it would pave the way towards roadside driver sleepiness testing to reduce sleepiness-related road accidents which is estimated to contribute to more road accidents than for all drug related incidents combined.

Sleep apnoea and falls risk in older people

Falls in older people are a major cause of morbidity and mortality.

One essential and currently ignored risk factor for falls is sleep health. A recently completed study has found that treating obstructive sleep apnoea with continuous positive airway pressure for 6 months can significantly reduce markers of fall risk in older people with sleep apnoea. These findings have major implications to fall prevention and rehabilitation, suggesting that treatment of sleep apnoea can reduce falls risk. The results have been recently accepted for publication in the journal Sleep Medicine and will be presented at the Sleep DownUnder conference in Brisbane in November 2022.

Developing a swallowing detection system

Swallowing disorder (dysphagia) is experienced by approximately 16% of individuals at least once in their lifetime, leading to pervasive and life-threatening disability for the individual.

Swallowing difficulties can arise from neurological disorders affecting the coordination and control of the muscles involved in swallowing (such as Parkinson's disease and sleep apnoea). Accurate detection of swallowing is essential for treating dysphagia and other swallowing disorders. Currently, we are working on an automatic swallowing detection system using airflow and epiglottic pressure signals. The technique (beta version) has been evaluated for 12 individuals with swallowing difficulties. The results are encouraging and can be easily adapted and tested in people with dysphagia using other biomarkers. Such a system will aid physicians in accurately detecting swallowing in clinical settings.



VCR headset



Research Fellow Dr Ganesh Naik developing the app to identify swallowing difficulties in dysphagia patients.

Women in Science

Associate Professor
Ching Li Chai-Coetzer



Sleep and Respiratory Clinician, Flinders Medical Centre

The Adelaide Institute for Sleep Health, initially set up as an incorporated group of researchers and SA Health clinicians has undergone considerable change over the last five years. And whilst the transfer to be a Flinders University research institute provided initial challenges (and a change of name), FHMRI Sleep health has now evolved as a multi-disciplinary, collaborative group that has grown considerably since our move to the College of Medicine and Health in 2019.

“As a clinical scientist, I want to bridge the gap between our practice in hospitals and what University based academics are researching. This is a key aspect to the work at FHRMI Sleep Health and there are many issues in sleep disorders and emerging treatments that we need to continue working on.”

A passion of mine is robust, reproducible science that can be implemented in practice to improve patient access to high quality, cost-effective clinical care. I feel privileged to be able to work with my patients whilst at the same time investigate improved diagnostic and treatment strategies for sleep disorders which are aimed at addressing structural health care inequalities. There is a strategic interaction between these actions that enriches all parts to my work. If we can continue to build robust, collaborative clinical sleep health research, we will be heading in the right direction.

At present, I am a chief investigator on a NHMRC Partnership Grant which will evaluate a model of care for the diagnosis and management of OSA and insomnia based in primary care, led by general practitioners and practice nurses. I am also currently leading a project in close collaboration with the South Australian Health and Medical Research Institute Wardliparingga Aboriginal Health Equity Theme and Indigenous community leaders to co-design and evaluate the acceptability of training Aboriginal health workers, or nurses, to set up a primary care-based pathway to identify and treat OSA within Indigenous communities.”

Health services

MOSIP (Management of OSA and Insomnia in Primary Care) Study

Funded by the NHMRC and supported by RACGP, Southern Adelaide Local Health Network, Country SA PHN, Australasian Sleep Association, and industry partners, this study will test a sleep disorders diagnosis and management package to improve the management of OSA and chronic insomnia in general practice.

The MOSIP study will be a cluster randomised controlled trial which aims to involve 20 primary care practices in metropolitan and rural/remote South Australia. Intervention practices will receive education on insomnia and OSA diagnosis and treatments, devices to diagnose and treat OSA, access to online cognitive behavioural therapy for insomnia (CBTi), practice nurse training to deliver brief CBTi, tailored treatment and referral pathways, specialist support, and reimbursement for patient-management activities. We hope to demonstrate that primary care-led management will reduce sedative-hypnotic prescribing and improve symptoms in patients with chronic insomnia and expedite diagnosis and treatment initiation in those with moderate-severe OSA. We are currently in the process of completing recruitment for a small pilot study of the intervention at a single southern Adelaide general practice clinic and will commence GP training and recruitment for the main RCT in early 2023.



The management of insomnia in Australia

Insomnia is the most common sleep disorder in Australia, 10-15% of adults have regular difficulties falling asleep or staying asleep which causes significant daytime impairment. General Practitioners (GPs) are the first port of call for people suffering from insomnia, however current management is problematic.

Clinical guidelines recommend Cognitive Behavioural Therapy for insomnia (CBTi) but most people with insomnia do not receive access to this evidence-based treatment. Many GPs currently prescribe hypnotic or sedative medications which are associated with high rates of adverse side effects, development of dependence, and withdrawal effects. This research project is investigating this discrepancy between clinical guidelines and current practice. Interviews have been conducted with GPs and psychologists, and survey data has been collected from people with insomnia, to better understand the management of insomnia in Australia from different perspectives.

Local delivery of health care services matters

Health services are continually required to make trade-offs around what services to provide. The preferences of patients are an important element of these decisions. We conducted national surveys with discrete-choice experiments to identify the preferences of patients for the organisation, logistics and costs

GP MOSIP Education Session

High level findings indicate that GPs need education on the diagnosis and management of insomnia in primary care, and use of mental health care plans to support referrals to a psychologist for CBTi. There is an urgent need for more psychologists to be trained in CBTi, both now and in continuing into the future. Use of other evidence-based treatments in primary care needs to be explored, including the use of brief behavioural treatment for insomnia (BBTi) and online CBTi programs. People with insomnia need to be made aware of effective treatment options and provided with information about referral pathways to see a psychologist trained in CBTi.



One of three clinic treatment and consulting rooms home to the FHMRI Sleep Health Insomnia Treatment Program (photo courtesy of Cheeseman Architects).

of diagnosis and management of sleep apnoea. This emphasised the importance of convenience and local delivery of service for patients, in addition to cost. Ongoing work is examining the value of different questionnaires in accurately capturing patient experience measures and symptoms of sleep problems and how these can be best used to measure sleep health services and patient-reported outcomes.

Population health and epidemiology

Tired of COVID?

AISH and Kings College London researchers are interested in COVID-19 (both acute and post-acute infection) and lockdown on sleep quality and mental health.

Between September 2020 and May 2021, the COVID Symptom Study Biobank invited 3,833 participants with confirmed infection, healthy uninfected controls and uninfected symptomatic individuals to complete online sleep and mental health questionnaires. As measured by the Pittsburgh Sleep Quality Index, Epworth Sleepiness Score, Sleep Condition Indicator and Epworth Sleepiness Score, longer symptom duration was associated with poorer sleep quality, increased sleepiness and increased fatigue compared with asymptomatic controls.

Similar results were found for depression and anxiety, as measured by the 2-item Patient Health Questionnaire and 2-item Generalized Anxiety Disorder questionnaire. Multivariate analysis revealed symptom duration, but not COVID-19 infection, to be an independent predictor of poor sleep quality after adjustment for age, sex, BMI, comorbidities and mental illness. However, both COVID-19 infection and symptom duration were independent predictors of fatigue. Results indicate that while prolonged COVID-19-like symptoms impair sleep, the infection itself does not directly impact sleep quality. However, prolonged symptoms of fatigue are more severe after confirmed infection.



Understanding Long COVID and sleep

There appears to be a clear association of Long COVID and sleep difficulties with approximately 41% of those with long COVID reporting moderate or greater sleep disturbance. However, most research thus far has been underpowered and based on self-reported questionnaire data. In a study being designed currently by researchers at FRMRI Sleep Health and Southern Adelaide Local Health Networks (SALHN) all participants who attend the Long COVID clinic at Flinders Medical Centre will complete validated questionnaires of sleepiness, fatigue, mental health and complete standardised testing including 6-minute walk test, timed up and go). They will also undergo actigraphy and home polysomnography to document the presence of sleep apnoea and review sleep architecture.

Poor sleep for many during COVID restrictions

A survey to identify impacts of COVID restrictions on sleep, mental and physical health, and socioeconomic/demographic factors was conducted between October and December of 2020. Of 797 men and 523 women participating in either the North West Adelaide Health Study or Florey Adelaide Male Ageing Study, 62% were aged 65 years or more (12% aged 35- 54yr), 69% were married/partnered, while 13% experienced social isolation (can get help from family, friends, neighbours when needed none or some of time).

In relation to socioeconomic hardship, 16.6% reported spending in excess of earnings or having just enough to get through to next payday (30% reported household income <\$40k) and financial position due to COVID was reported as being a lot worse by 4% and slightly worse 18%, while 69% stayed the same and 9% reported a slightly or a lot better position. Prior to restrictions, 37.8% reported full time, part time, self-employment between Jan-March 2020 of whom 53.5% reported no change to work as a result of COVID and a further 23% reported usual hours working from home/different duties or location while 13.5% reported reduced hours and 8.6% made redundant/stood down or forced leave.

Poor sleep during COVID restrictions were common (44% with high Pittsburgh Sleep Quality Index scores; poor sleep troubling you in general – “a little” reported by 34% and “somewhat, much, very much” by 13%. Symptoms of anxiety/depression (22%) were associated with the following factors: Poor sleep (troubling in general), low coping style, social isolation [no relationship/partner, getting help (from family, friends neighbours) none/some/most of time], financial stress, delays/ missed prescribed meds, increased overall food intake since restrictions began, current smoking, and physical inactivity (sedentary).

Sleep apnoea and cognition

Although links between sleep apnoea and cognition have been seen in small clinical samples, there have been few longitudinal studies in community samples examining this question. Using longitudinal data from the MAILES cohort we have been examining the associations between usual metrics on sleep studies and spectral analysis of quantitative EEG recordings. Results have shown novel findings that specific sleep spindle metrics during N2 and N3 sleep were independently associated with better visual processing speed and worse executive attention, suggesting a differential association between cognitive function and spindles during N2 and N3 sleep. PhD student Jesse Parker will be presenting one of his analyses in the Young Investigator Award session at the Australasian Sleep Association Sleep Down Under conference in November, entitled, “Longitudinal associations of obstructive sleep apnoea and sleep macroarchitecture with future cognitive function in middle-aged and older men from a community-based cohort study”.

Novel metrics gain insight into links between sleep apnoea and chronic conditions

Using MAILES data in a large community cohort of men we have examined the longitudinal associations of sleep disorders breathing and diabetes. This has emphasised the importance of intermittent nocturnal hypoxia and the significance of obstructive events in REM sleep to increased risk of developing diabetes, independent of other important factors, including smoking, obesity and testosterone levels in men. We are also applying deep learning techniques to see if novel markers on sleep studies can be identified that may better show if sleep apnoea in those less overweight may be a more important factor in diabetes risk.

Women in Science

Associate Professor Sutapa Mukherjee



Sleep and Respiratory Clinician, Flinders Medical Centre

“There are multiple projects underway in collaboration with researchers at SALHN and FHMRI Sleep Health on non-invasive ventilation, chronic obstructive pulmonary disease (COPD), Motor neurone disease (MND) and hypersomnolence. These ongoing collaborative projects encompass early career researchers (medical students, advanced trainees), consultants and academics and FHMRI Sleep Health input is invaluable to these clinical research projects.”

Our people

At FHMRI Sleep Health we value the different experiences and perspectives our people bring to their work and their studies. We are committed to individual and group actions to create and maintain a safe, welcoming and inclusive environment built upon respect, dignity, fairness, caring and equity for all peoples, cultures and histories.



The next generation of researchers

At any given point, AISH fosters a multi-disciplinary cohort of 20+ PhD candidates from backgrounds in clinical, bio-medical engineering, psychology and nursing.



Some of the talented PhD candidates at FHMRI Sleep Health (from left) - Ashley Montero, Darah-Bree Benson-Boakes (winner of the Outstanding New Researcher, ASA (SA) 2022 Award) and Jenny Haycock alongside Atqiya Aishah and Jesse Parker, - both of whom are at the point of final submission.

These self-directed PhD candidates - the highest level of study offered in Australia, make unique and novel contributions to the field of sleep medicine.



PhD candidates Jack Manners and Kelsey Bickley, FHMRI Sleep Health.



Dr Simon Proctor, clinician and PhD candidate.

Nick Antic Scholarship

In 2019, the year we also opened the door of our newly established premises, we also launched the Nick Antic Scholarship. This competitive scholarship program has been funded through donors of the Flinders Foundation. This has enabled better support to the next generation of sleep scientists and we sincerely thank Flinders Foundation who have chosen to once again support this valuable program.

Sian is researching sleep, sleep disorders, and mental wellbeing in Australian paramedics.

“This includes a scoping review of interventions to improve paramedic sleep and mental wellbeing, a qualitative study exploring the lived experience of shift work, sleep loss, and fatigue in Australian paramedics, a project on the feasibility and acceptability of sleep disorder screening in undergraduate paramedic students and Sleep education intervention for paramedics and finally by utilising insights from the qualitative project, aims to deliver sleep education to current paramedics.”



PhD candidate Sian Wanstall, winner of the 2022 Nick Antic Scholarship.

Working with community

FHMRI Sleep Health is guided by two external groups; a Consumer Committee and an External Advisory Group.

Consumer input is key to our success. Whilst FHMRI Sleep Health have always engaged with consumers through clinical services and through staff contributions on the Australian Sleep Association Consumer Committee, the FHMRI Sleep Health Consumer Committee was established in 2021 as a more formalised process of acknowledgement and to increase co-designed research. This is enabling our research to ensure that studies are informed by their perspective and always conducted with the needs and experience of sleep health consumers in mind.

We are very grateful and thank the people who have volunteered their time to enhance the translation of our research.



“We are fast moving into an era where new technologies can provide convenient ways to capture subjective evaluations of sleep quality and insights into the impacts that disrupted sleep has on people’s daily lives and the things that matter most to people who experience sleep problems. New technologies are also providing novel diagnosis tools and insights into the longer-term effects of sleep problems that were previously not possible.

For example, through the use of under mattress sensor technology, we are able to collect nightly sleep data over a longer period in peoples own homes at scale– a situation that is quite different to the controlled environment of our sleep laboratory.

At a recent meeting, consumer committee members provided feedback on the design of a recent study trial, indicating that both quantitative and qualitative contextual data need to be examined.

We believe adding these combinations of data, which can now be readily and reliably captured with these new technologies, will provide unique insights into the effects of different forms of sleep disruption and its consequences so that we can develop better tailored therapeutic solutions.”

Professor Danny Eckert, SAMOSA trial, Chief

External Advisory Board



Prof. Garry Jennings AO

External Advisory Chair

Chief Medical Advisor of the Heart Foundation
Senior Advisor Sydney Health Partners
Honorary Professor Medicine, University of Sydney



Prof. David White

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Harvard Medical School



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Vice President

Clinical Science, ResMed



Mr Alex Gold

Entrepreneur

Co-Founder of Myia Health
and Consumer Advisor



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Prof. Karen Reynolds

Dean of Research

College of Science and
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University



Emeritus Prof. Leon Lack

Adelaide Institute for Sleep
Health (AISH)
Flinders University



Prof. Peter Eastwood

FHMRI Director

College of Medicine,
Flinders University

Message from the medical director

As an editorial in *The Lancet* (2020) recently said, “For an activity that takes up a third of every human being’s life, sleep has received, hitherto, much less attention than it deserves by physicians, health-care professionals, and policy makers”. The editors deliver “a wakeup call to all about the importance of good sleep and the fact that studying, assessing, and treating its disorders should receive greater prominence in modern medicine”.

Over this year we have taken major steps to bring research and clinical medicine together, showing the importance of sleep to many areas of health and demonstrating how health services can better work to improve sleep health. Photo: Professor Robert Adams, Medical Director, FHMRI Sleep Health

Over the coming year we will expand our research-focused clinics, particularly in management of insomnia and circadian disruption, and work with our key industry partners to help better manage sleep problems in shift workers. We are also excited to start to bring our vision of personalised sleep medicine to the diagnosis and management of sleep apnoea to the clinic to help create a real “sleep revolution”.

Professor Robert Adams

Medical Director, FHMRI Sleep Health
College Medicine and Public Health



Professor Robert Adams, Medical Director FHMRI Sleep Health, Sleep and Respiratory Clinician, Flinders Medical Centre

FHMRI Sleep Health have strong collaborations with academic partners, government bodies and professional organisations.





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For further information about us, please visit:
[www.flinders.edu.au/health-medical-research-institute/
clinical-translation/sleep-health](http://www.flinders.edu.au/health-medical-research-institute/clinical-translation/sleep-health)

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