
ADVOCATING FOR MUSCULOSKELETAL RESEARCH IN AUSTRALIA



Executive Summary

This paper provides an analysis of musculoskeletal conditions and musculoskeletal research funding in Australia. It highlights the gap between the prevalence of conditions and the level of grants available to researchers.

Musculoskeletal conditions are a broad set of conditions including, but not limited to, back problems, osteoarthritis, sarcopenia, osteoporosis, and rheumatoid arthritis. These types of conditions are the fourth-leading contributor to the burden of disease in Australia, affecting 30% of the population, or almost 7 million people.¹

Musculoskeletal conditions have a substantial impact on health, productivity and healthcare costs. The impact of these conditions includes reduced independence and life participation, as well as reduced life expectancy and increased disability. In nearly four out of five cases, co-morbidity exists – that is, at least one other chronic condition such as cardiovascular disease (CVD) exists alongside the musculoskeletal disorder.

Musculoskeletal conditions account for 20% of years lived with a disability (YLD) across Australia and a considerable level of lost productivity.² They are also responsible for around 41% of cases of early retirement.³

These conditions account for around 9% of healthcare expenditure for disease groups.¹ This includes costs for primary healthcare, specialist care, pharmacology and surgery. Musculoskeletal conditions can also be associated with increased mortality, contributing to about 1 in every 20 deaths, especially when associated with a co-morbidity.⁴

There are also social gradients associated with musculoskeletal conditions, where social and economic disadvantage can impact negatively on health. For example, the prevalence of musculoskeletal conditions is for the most part higher in indigenous populations than in all other populations in Australia.¹

Despite the growing prevalence of musculoskeletal conditions in Australia, investment in research comprises less than 4% of total healthcare funding grants. This indicates these conditions are given a low priority in Australia in terms of research to find evidence-based solutions.

In addition, just over 4% of funding granted to the University of Melbourne (UoM) for healthcare research in 2018 was allocated to musculoskeletal conditions. This leaves musculoskeletal researchers with limited resources for undertaking rigorous research and development into these conditions.

There are also gaps in knowledge about musculoskeletal conditions among both doctors and medical students. Improvements in awareness and knowledge are critical for improving the health of patients suffering from these conditions, from childhood to adulthood.

Our aim is to increase awareness of the prevalence of musculoskeletal conditions in Australia, to lobby for increased funding from state and federal governments for research and development purposes, and to position musculoskeletal research within the research agenda of UoM and other institutions.



Prevalence of musculoskeletal conditions in Australia

Musculoskeletal conditions affect bones, muscles, joints and connective tissues. There are many conditions that fall within this area. Some of the more common conditions include osteoarthritis, rheumatoid arthritis, juvenile arthritis, sarcopenia, osteoporosis, lupus, back pain, neck pain and gout.

According to the most recent World Health Organisation (WHO) fact sheet⁵ musculoskeletal conditions include conditions that affect:

- Joints – such as osteoarthritis, rheumatoid arthritis, psoriasis, gout and ankylosing spondylitis
- Bones – including osteoporosis, osteopenia and associated fractures from fragility and traumatic fractures.
- Muscles – e.g. sarcopenia.
- The spine – such as back and neck pain.
- Multiple body areas or systems – widespread pain disorders and inflammatory diseases that have musculoskeletal manifestations, such as lupus erythematosus.

The Australian Institute of Health and Welfare (AIHW) states that musculoskeletal conditions affect about 30% of the population – or about 7 million people. Of these, the most common conditions are back problems at 3.7 million and osteoarthritis at 2 million.¹

Musculoskeletal conditions make up 23% of the non-fatal burden of disease in Australia.¹ The data also indicate that about two-thirds of people over the age of 50 in Australia have poor bone health (osteoporosis or osteopenia). 1.2 million people are affected by osteoporosis.³

These conditions are the second leading cause (after mental health problems) of non-fatal disease burden in people between the ages of adolescence and 45 years, and the leading cause for people aged 45 to 55 years. They are also the leading cause of non-fatal disease burden for women.¹

Musculoskeletal conditions affect more women than men¹. Women are also more likely than men to have arthritis and osteoporosis.⁶ In addition, two out of every three deaths involving a musculoskeletal condition in 2013 were women.⁴

While the rate of musculoskeletal conditions is generally similar across most states and territories, it is higher in areas of lower socioeconomic groups and in very remote regions.¹

It is also higher amongst Aboriginal and Torres Strait Islander people, except for back problems which are higher in non-indigenous populations.¹

Of all the musculoskeletal conditions in Australia, arthritis has some of the greatest impacts. Osteoarthritis, for example, can affect up to 20% of all people over the age of 60, and of these, approximately two-thirds will be affected moderately or severely by the disease. Rheumatoid arthritis is also prevalent, affecting more women (especially of child-bearing age) than men. Other arthritic conditions include seronegative arthritis which affects mostly younger men, and gout which affects men of middle age or older.

There are also rarer connective tissue conditions such as lupus, scleroderma, dermatomyositis and Sjogren's syndrome. These conditions can cause life-threatening complications and result in lifelong disability and premature death.

Importantly, musculoskeletal conditions don't just affect adults. There is growing evidence to suggest that musculoskeletal conditions have their origins early in life and only manifest in adulthood. Compellingly, for every 15% increase in bone accrual in childhood, the onset of osteoporosis is delayed by 13 years. Therefore, early life strategies and prevention should also focus on the paediatric population.⁷

According to the Australian Institute of Health and Welfare, 1 in 1000 children aged between 0 and 15 years are diagnosed with juvenile arthritis, with the condition more prevalent in girls than boys. Musculoskeletal conditions in Australian children are the sixth most common type of condition managed by primary care systems, accounting for 4.9% of all conditions managed.⁸

Prevalence of common types of musculoskeletal conditions:

- Back problems – may involve back pain, sciatica, leg numbness, disc disorders, spinal and joint deterioration, pressure on the spinal nerve and neck pain. Back problems are the third-leading cause of disease burden. While about 16% of the population reported back problems in 2014-15, it is estimated that up to 90% of people will suffer lower back pain at some stage in their lives.⁹
- Sarcopenia – defined as loss of muscle mass and strength, affecting 20% of the Australian population, and nearly three times as many women as men. In 2019 sarcopenia was assigned an ICD-10-AM code in Australia, giving it recognition as a distinct, reportable condition.¹⁰ This will lead to a dramatic increase in the identification of the disease in Australia.
- Osteoporosis – reduction in bone density leading to bones becoming porous and more susceptible to fracture. It affects 10% of the population and nearly four times as many women as men.¹¹
- Osteoarthritis – the breakdown of cartilage affecting mostly the knees, hips and spine, and often resulting in knee and hip replacement surgery. The condition affects about 9% of the population and is more common in women than men.¹²
- Rheumatoid / inflammatory arthritis – autoimmune diseases that cause joint inflammation and pain, affecting about 2% of the population.¹³ Inflammatory arthritis also includes seronegative arthritis, ankylosing spondylitis, Sjogren's syndrome, lupus and psoriasis. Other conditions include soft tissue rheumatism such as rotator cuff arthropathies (shoulder arthritis), carpal tunnel syndrome and bursitis.

Gaps in knowledge

While evidence for the burden of musculoskeletal conditions is very strong, medical and allied health students are rarely exposed to teaching on these diseases. This is especially the case with sarcopenia, which has only recently been recognised as a distinct condition. In addition, training for health care professionals on bone health continues to be inadequate, according to the Osteoporosis National Action Plan 2016.

To improve outcomes, these gaps need to be addressed. Knowledge gained regarding these conditions also needs to be translated into clinical training and practice.

Musculoskeletal diseases and their impact on health

The impact of musculoskeletal conditions is substantial. Musculoskeletal conditions make up almost 12%¹ of the total burden of disease in Australia.

Musculoskeletal conditions account for 31% of disability, and 85% of chronic pain.¹ These conditions can affect the health and wellbeing of sufferers – for example, by reducing physical activity, independence and employment. In older people especially, lack of physical activity contributes to increased frailty and faster decline in health and wellbeing.

Musculoskeletal conditions also lead to higher rates of disability, poor general health and psychological distress. These conditions can also affect a person’s quality of life and ability to perform daily living activities.

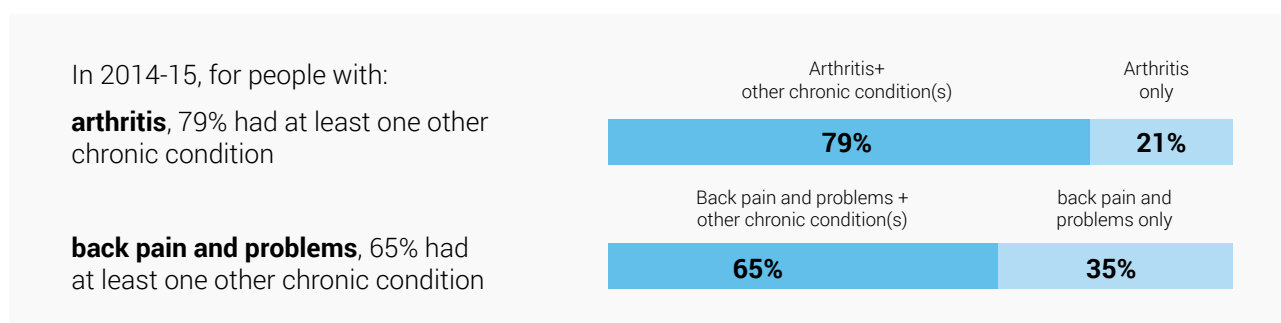
According to the WHO, musculoskeletal conditions represent a threat to healthy ageing.¹⁴ Where poor bone health exists, for example, it can lead to an increased risk of fractures (especially of the hip and spine), which can cause permanent disability or even death. Some conditions such as osteoporosis and arthritis are also known to increase the risk of falls in sufferers, in turn increasing the risk of severe injury or death.

Musculoskeletal conditions do not usually exist in isolation. In about 79% of cases, a musculoskeletal condition occurs with at least one other chronic condition – such as CVD or mental health problems.¹⁵ Having a musculoskeletal condition often limits a patient’s ability to manage other chronic conditions they may have.

Early lifestyle factors such as physical activity can influence bone accrual, with evidence suggesting that higher levels of physical activity in childhood result in increased bone mass into adulthood. Adolescence is an optimal period for maximal bone accrual, with participation in physical activity positively influencing bone development. However, at this optimal period, there is an 8% dropout rate of sports participation due to lack of interest and injury. In fact, the majority of musculoskeletal conditions in children are due to sports participation and a lack of injury prevention.¹⁶

With fewer than 1 in 3 Australian children aged 5 to 17 years meeting the guidelines for sedentary behaviour (no more than two hours of screen time) and over 70% of adults leading sedentary lifestyles, the rates of osteoporosis and poor bone health over the next decade will increase, having a continued negative impact on public health.

Comorbidity



Australian Institute of Health and Welfare 2018. Australia's health 2018. Australia's health series no. 16. AUS 221. Canberra: AIHW

Risk factors

Risk factors for musculoskeletal and associated conditions include age, occupations involving manual labour, and lifestyle factors such as poor diet, smoking, and lack of physical activity.

Being overweight or obese is also a risk factor and contributes approximately 45% of the burden of osteoarthritis.¹⁵

Various social determinants – such as poorer living and working conditions and reduced access to healthcare services and education – can also increase the risk of many musculoskeletal conditions.

Musculoskeletal diseases and their impact on productivity

In 2017, (YLD) due to musculoskeletal conditions in Australia was 20% of all YLDs for both men and women. The most common condition was lower back pain, at much the same rate as in 1990.² This reflects a lack of progress in addressing this and other musculoskeletal conditions.

Musculoskeletal conditions are also the second leading cause overall of non-fatal disease burden after mental health conditions and substance abuse.¹

People with musculoskeletal and associated conditions can be subject to lower rates of participation in work and education. According to WHO, musculoskeletal conditions “account for the greatest proportion of lost productivity in the workplace”.¹⁷

Musculoskeletal conditions are also responsible for 41% of early retirement cases in the 45-64 age group and \$16 billion worth of GDP losses in Australia.³

In Australia MUSCULOSKELETAL conditions are the leading cause of Years Lived with Disability (YLDs) accounting for 20% of total YLD's (a measure of the burden of disease)

Global Burden of Disease Study (2017)

Years Lived with a Disability (YLDs)

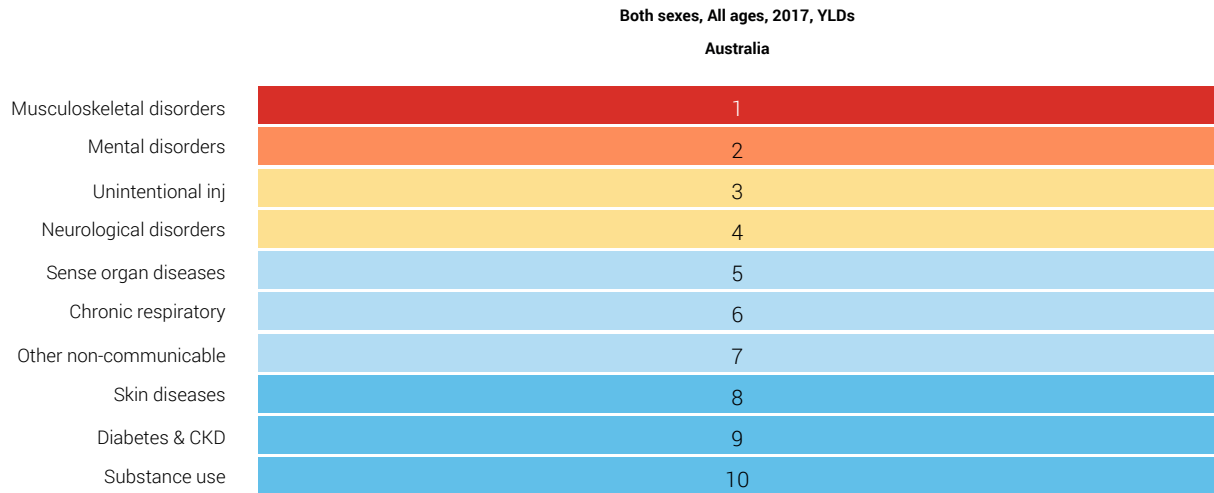


Figure 1 Leading causes of Years Lived with Disability, Australia, 2017, All causes. Source: Global Burden of Disease 2017 Data visualisations, <http://vizhub.healthdata.org/gbd-compare>

Disability Adjusted Life Years (DALYs)

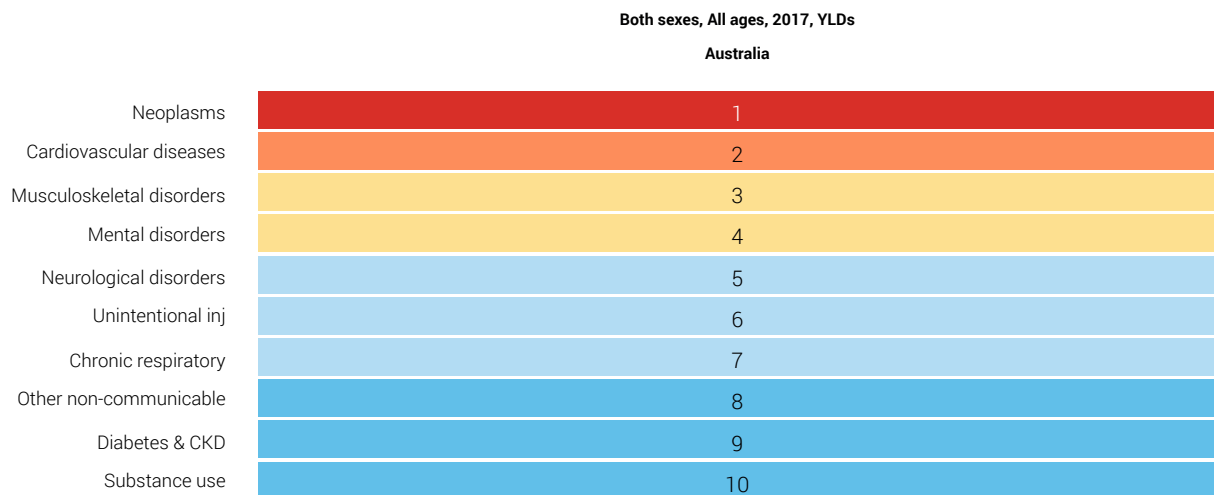


Figure 2 Disability Adjusted Life Years (DALYs), Australia, 2017, 10 Leading Causes. Source: Global Burden of Disease 2017 Data visualisations, <http://vizhub.healthdata.org/gbd-compare>

Australia, Both sexes, 2017

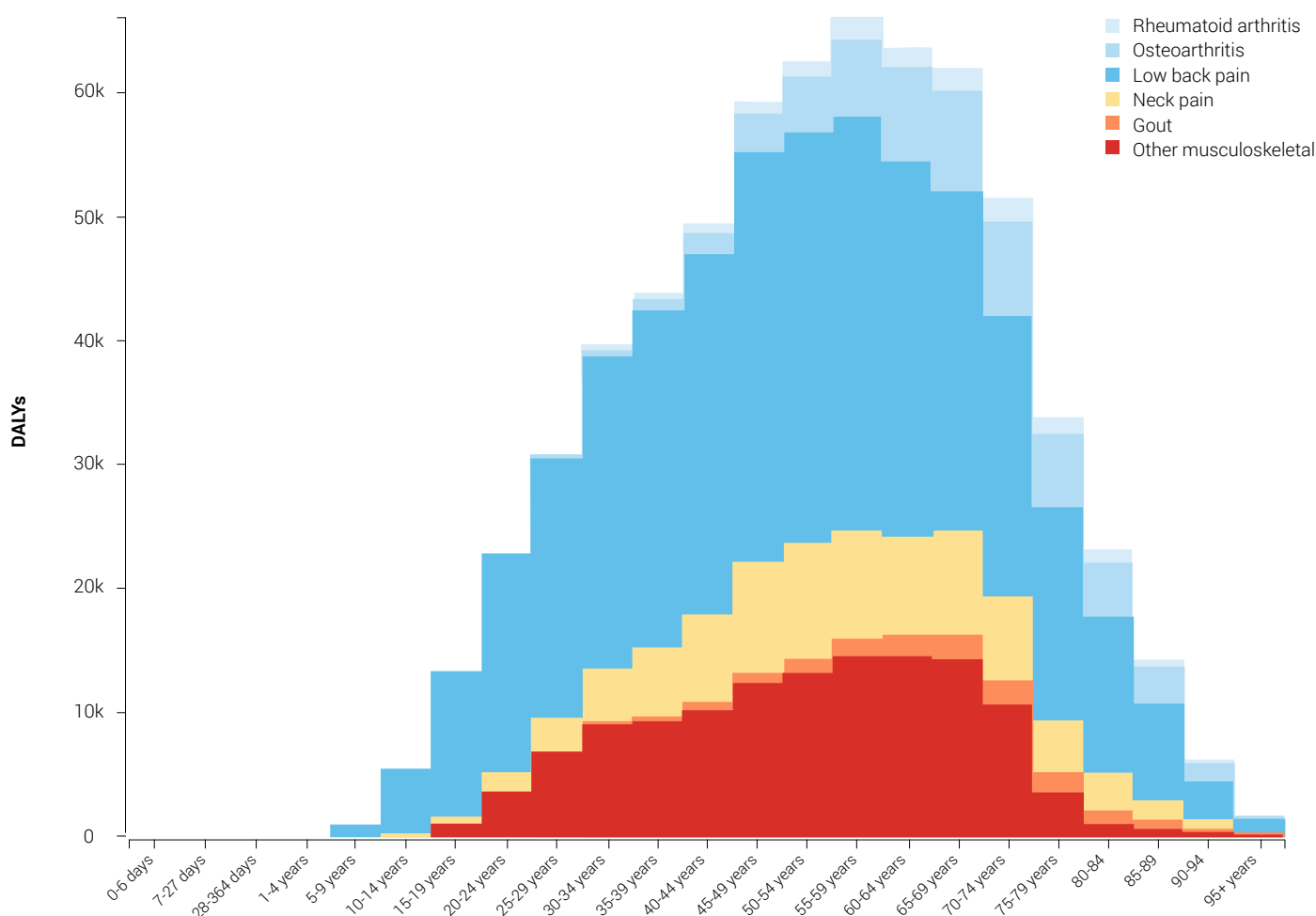


Figure 3 DALYs Australian Musculoskeletal 2017 Global Burden of Disease 2017 data visualisations

Musculoskeletal diseases and their economic impact

Musculoskeletal conditions are the fourth most costly condition to the health system after CVD, oral health and mental disorders, accounting for about 9% of expenditure allocated to all disease groups.¹

Costs attributed to musculoskeletal conditions in 2008-09 were estimated to be \$5.7 billion. They were also estimated at more than \$5.5 billion for arthritis alone in 2015 – indicating that costs are rising. The cost of arthritis is predicted to rise to \$7.6 billion by 2030 without intervention and better prevention.³

Costs involved include primary health care and specialist care, pharmacology for pain management and disease modification, joint replacement surgery for osteoarthritis, and surgery for fractures. In 2015-16, there were over 763,000 total hospital admissions

for musculoskeletal conditions, representing around 7.2% of hospitalisations.⁶

Of notable concern is the cost of inflammatory arthritis conditions. The new ‘biologic’ therapies for these conditions are very expensive and a huge burden on our health care system. For example, the cost of biological DMARDs (disease-modifying anti-rheumatic drugs) for inflammatory arthritis alone in Australia is close to \$2 billion annually.

Having a musculoskeletal condition can also reduce a sufferer’s productivity and ability to earn income, due to pain, muscular and nerve impairments and disability.

Musculoskeletal diseases and mortality

While musculoskeletal conditions contribute to a substantial proportion of non-fatal disease burden in Australia, they can also be associated with mortality – either directly or indirectly.

Musculoskeletal conditions are more likely to contribute to death where there is co-morbidity present – that is, the condition exists with another chronic illness. This is largely because co-morbidity can complicate disease treatment and management.

More than half of deaths where a musculoskeletal condition was an associated cause were due to osteoporosis, sarcopenia and osteoarthritis.

Musculoskeletal conditions contributed to about 1 in 20 deaths (6,963 deaths) in Australia in 2013. Of these, the highest contributor was osteoporosis – at 1,856 deaths.⁴

The data shows an increased risk of CVD associated with osteoarthritis, gout and rheumatoid arthritis, and higher overall mortality risk with daily back pain, lupus, and sarcopenia.

Osteoporosis leading to hip fractures was associated with increased mortality, often due to complications from surgery such as clots, infections and heart failure.⁴

Hip fracture patients are also 3.5 times more likely to die within one year of surgery compared to those who are not injured.¹⁸

In Australia two thirds (68%) of deaths with musculoskeletal conditions listed as an underlying cause were among Women in 2013

Osteoporosis (29%, 1,689) and Osteoarthritis (27%, 1,558) accounted for over half of the musculoskeletal conditions listed as an associated cause of death in Australia in 2013

1 in 20 deaths in Australia were directly caused by, or attributed to by, musculoskeletal conditions (6,393 deaths)

AIHW (2016) Bulletin 136

Current investment in musculoskeletal research

Despite being a significant contributor to the total disease burden, musculoskeletal conditions are not treated as a research priority in Australia.

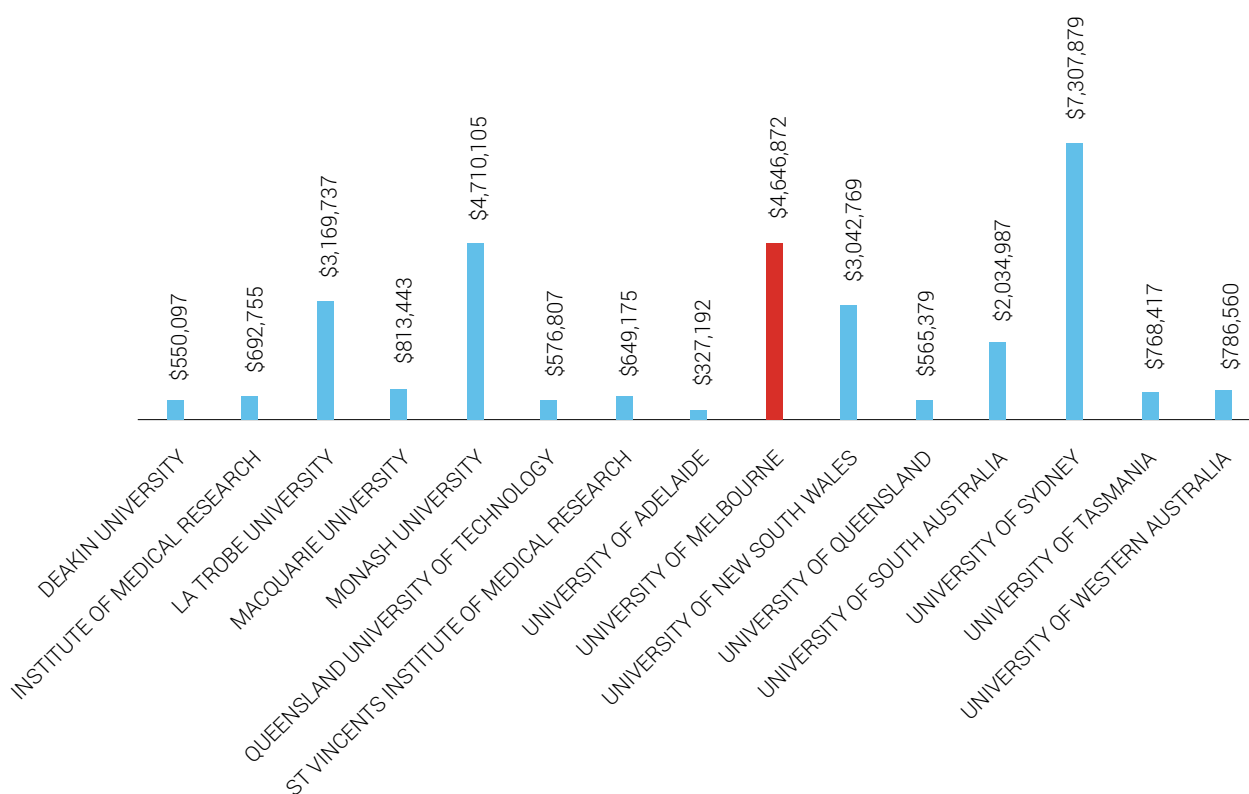
Current investment in research for musculoskeletal conditions is low. In 2018, \$30.9 million was awarded by the National Health & Medical Research Council (NHMRC) for musculoskeletal research – representing 3.95% of NHMRC total funding of \$783 million.

This indicates that while musculoskeletal conditions might be a significant problem in Australia, research in this field is not given a high priority.

Gaps in research funding have also been attributed to previous underestimations of the contribution of musculoskeletal conditions to the burden of disease at 4%, rather than the more recent estimate of 12%.¹

Other sources of funding for musculoskeletal conditions may include the Medical Research Future Fund (MRFF) and alternate funders such as philanthropists and health insurers. According to the MRFF grant recipients announced and under contract since 2016-17 dataset, current as at April 4 2019, there have been seven individual musculoskeletal grants worth approximately \$2.5 million.¹⁹

2018 MSK DISTRIBUTION (\$30,969,366) ACROSS UNIVERSITIES/INSTITUTES



University of Melbourne funding for musculoskeletal research

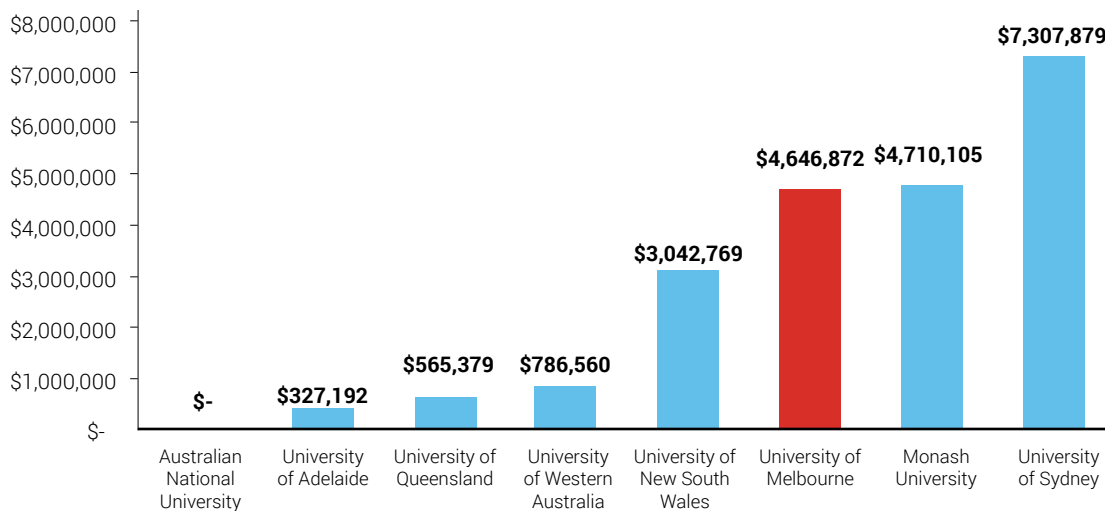
NHMRC funding for UoM in 2018 amounted to \$104 million, of which \$4.6 million (or 4.44%) was directed towards musculoskeletal-focused research. This funding also represents less than 1% (0.59%) of total NHMRC funding.

By contrast, nearly 23% of UoM health funding was directed to cancer research. NHMRC total funding for cancer-related research also amounted to 15.38% of the total.

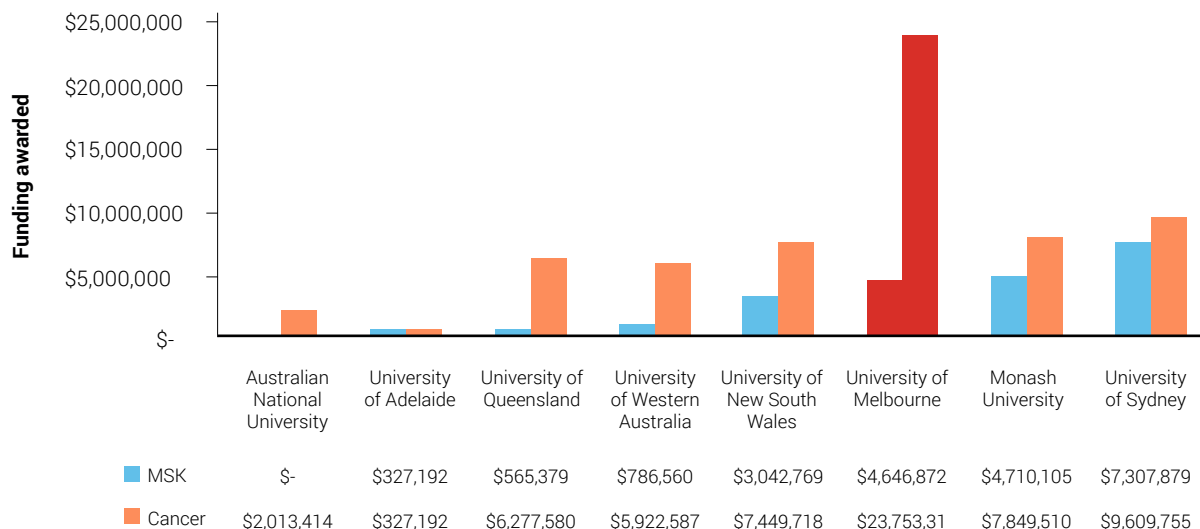
Funding for musculoskeletal research compares poorly with that awarded for cancer research at UoM and across other universities.

This is despite musculoskeletal disorders costing the health system more than cancer. In 2013-14, total health expenditure was \$155 billion. Of this, around \$3.5 billion was for chronic musculoskeletal disorders and approximately \$3 billion for cancer and other neoplasms.²⁰

Group of Eight Universities - NHMRC 2018 MSK Distribution



**Comparison of investment to MSK and Cancer research
across Group of Eight Universities**



Towards a strong research agenda for musculoskeletal diseases in Australia:

Musculoskeletal Research Forum, University of Melbourne

The University of Melbourne / Australian Institute for Musculoskeletal Science (AIMSS) Musculoskeletal Research Forum was held at AIMSS, on Friday, August 3, 2018.

The aim of the forum was to bring together a critical mass of musculoskeletal researchers, to increase funding for and awareness of musculoskeletal conditions in Australia.

Keynote speakers were Professor Arthur Conigrave, Head of the Sydney Medical School, and Dr Heather St John, Director of the MRFF strategy at UoM.

The forum highlighted the importance of musculoskeletal research in Australia. It also presented opportunities to:

- Develop a network of UoM researchers interested in musculoskeletal research.
- Position musculoskeletal research within the university's research agenda.
- Design common funding strategies.
- Establish networks and collaborations within UoM.
- Strengthen the university's reputation as a major hub for musculoskeletal research in Australia.

Forum presentations

The forum brought together a range of researchers across various disciplines, ranging from basic sciences to clinical research.

Groups represented:

- Medical Imaging and Basic Sciences, Department of Medicine - Western Health.
- Centre for Health, Exercise and Sports Medicine Osteoarthritis Research, University of Melbourne.
- Rheumatology, University of Melbourne.
- Department of Medicine, University of Melbourne, Royal Melbourne Hospital.
- Orthopaedic Department, Western Health.
- Hugh Williamson Gait Analysis Laboratory.
- Harvard Medical School.
- The Florey Institute.
- Department of Veterinary Biosciences, Melbourne University.

- Departments of Medicine and Endocrinology, Austin Health.
- Institute for Physical Activity and Nutrition, Deakin University.
- Department of Clinical Epidemiology, Alfred Hospital.
- Institute for Health and Sport, Victoria University.

There were eighteen presentations in total, representing a range of musculoskeletal research projects. These covered the following topics:

1. Advanced medical imaging for musculoskeletal disease.
2. Exercise outcomes for osteoarthritis.
3. Use of Macrophage-Colony Stimulating Factor and CCL17 in rheumatoid arthritis and osteoarthritis.
4. Orthopaedic surgery longitudinal outcomes.
5. 3D motion analysis and musculoskeletal modelling in clinical decision-making.
6. Predicting spinal fractures.
7. The social gradient of bone and joint health.
8. Musculoskeletal, cardiovascular and physical activity after stroke.
9. Animal studies on muscle and bone-cell biology.
10. Benefits and limitations of quantitative imaging technologies for bone fragility.
11. Feasibility of recumbent bike-riding in people with a fractured hip.
12. Improving nutritional status in older Australian adults.
13. Functional anatomy and biomechanics group.
14. The role of reproductive hormones in health and disease.
15. Muscle mass and strength in sedentary children.
16. ANZMUSC (Australian and New Zealand Musculoskeletal) clinical trials review.
17. Closing the communication gap in health care.
18. Clinical sarcopenia program strategies.

Conclusions of the Forum

UoM and AIMSS have excellent world-class facilities and researchers that can enable a strong pipeline of research from basic science through to translation into policy and practice.

However, there are gaps and barriers to making this happen optimally. These include:

- Lack of funding for musculoskeletal research – from both government organisations and alternate or novel sources, reducing researchers' capacity to adequately perform research and development.
- Underuse of current resources – such as existing electronic datasets and biobanks.
- Lack of strategic focus and research coordination – due to a silo approach where organisations do not sufficiently share information.
- The low priority given to research in this field – could be remedied by becoming proactive in leading the research agenda in this space, not only in the basic sciences but all the way through to practice and population impact.
- The low profile of research and facilities – e.g. with government and public and medical communities, which should be improved through lobbying and advocacy.
- Lack of communication strategy – developing a strategy for communication would enable us to present 'one voice' when communicating with the government and other organisations.
- Connectivity needs improving – such as with sector leaders, policy leads, professional associations, industry (e.g. pharmacology), colleges, and health organisations such as the Heart Foundation and Cancer Council.
- Skilled workforce sustainability required – involving attracting and retaining the best and brightest in the field (including through mentorships and fellowships).
- Establishing musculoskeletal as a Field of Research (FoR) Code – however, this may not be realistic given the diversity of the field.

Proposed strategies and solutions

A number of strategies and solutions to addressing these barriers have been proposed.

1. Collaboration and development of networks:

Improved networking and collaboration should enable sharing of skills, resources, data and ideas. This may include:

- A better connection of people/researchers at multiple sites through streaming / remote audiences.
- Greater collaboration (as opposed to competition) of internal groups. This is already happening to some extent – for example, the rheumatology and orthopaedics departments at UoM are already collaborating on arthritis conditions.
- Gathering for purposes other than scientific meetings and conferences.
- Improving data sharing among groups and teams.
- Greater involvement of other successful teams (e.g. cancer research) and creating awareness of each other's skills and resources.
- Attending a broad range of meetings outside of the niche area.
- Holding regular meetings to discuss research ideas and to brainstorm applications.
- Linking with NGOs and policy drivers/makers – e.g. Osteoporosis Australia, Musculoskeletal Australia, ANZMUSC, Arthritis Australia.
- Linking with Scientific Societies – e.g. ANSBMS, ANZSSFR, ANZSGM, APEG, ARA and the Endocrine Society.

Towards a strong research agenda for musculoskeletal diseases in Australia:

Musculoskeletal Research Forum, University of Melbourne

2. Increased investment in musculoskeletal research

To bring attention to the state of musculoskeletal disorders and to develop evidence-based treatments, research funding needs to be increased to reflect the prevalence of musculoskeletal conditions in Australia. This will require effective lobbying of state and federal governments with the aim of securing higher funding.

This may be achieved by:

- Political lobbying by scientists, researchers and patients.
- Letters to Members of Parliament from patients/carers that have experienced preventable fractures.
- Interactions with private enterprise – e.g. aged care facilities, insurers and within the industry.
- Developing strong proposals for grant funding.
- Preparing the field to attract philanthropic support.
- Looking ‘outside the box’ for grant opportunities.

3. Increased awareness and support of stakeholders

University of Melbourne:

A coordinated communications strategy is needed to strengthen the profile of the UoM and AIMSS as major hubs for musculoskeletal research in Australia. Possible solutions include:

- Improving visibility – e.g. through attendance at forums.
- Economic modelling of costs and burdens of musculoskeletal diseases.
- Bringing together educative professionals for musculoskeletal awareness events.

- Inclusion of medical and allied health students – e.g. for voluntary work.
- Developing FoR code for musculoskeletal research, a move which is already underway.
- Advocating for musculoskeletal conditions to move up on the list of research priorities.
- Getting musculoskeletal conditions back as a research domain.
- Educating GPs regarding musculoskeletal conditions.
- Speaking to particular stakeholder groups.

4. Improving public support:

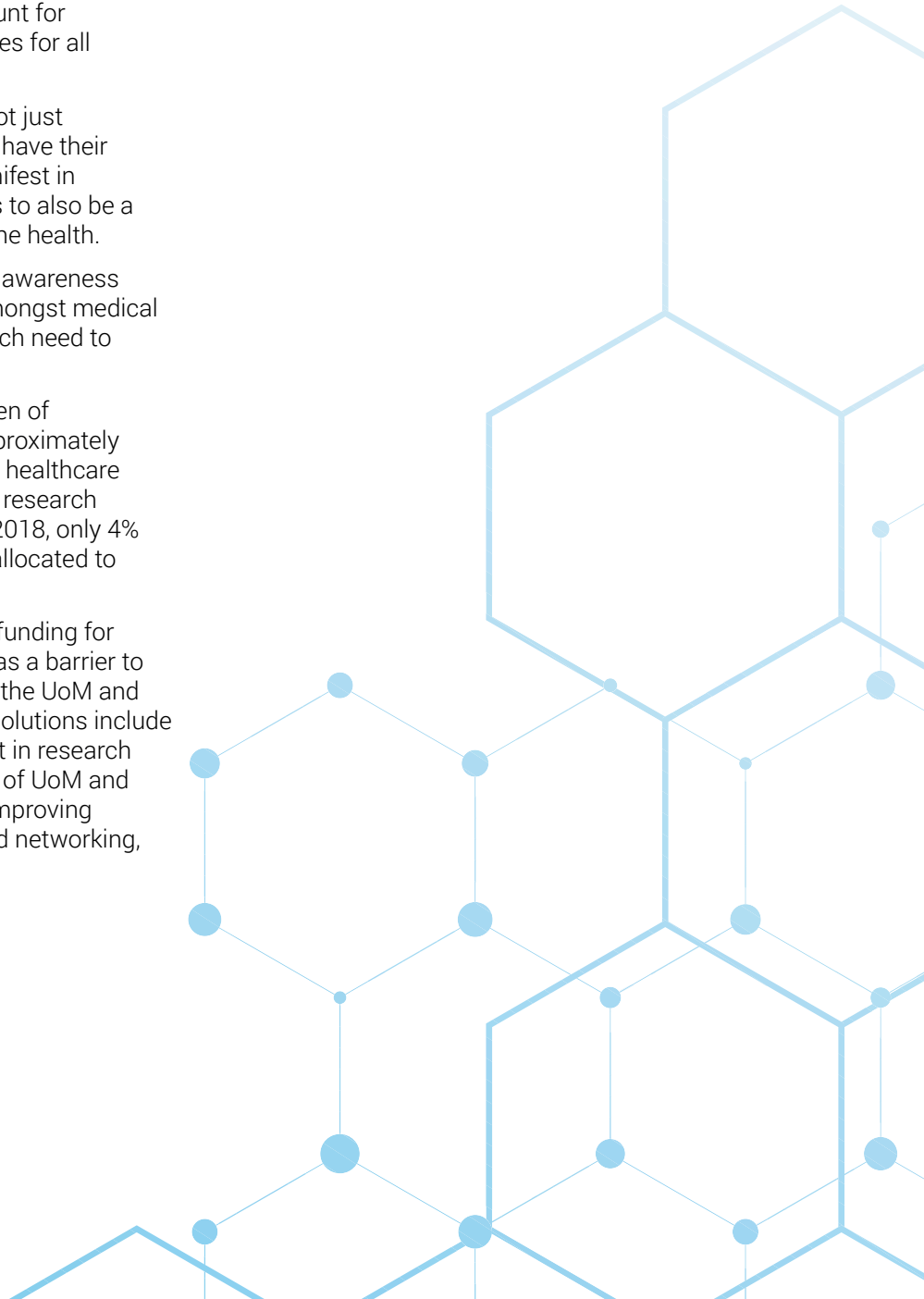
This involves creating strategies to communicate and engage with the public regarding musculoskeletal conditions and the importance of research and prevention. Proposed solutions:

- Marketing and social media to communicate the impact of research.
- Better communication and education to improve public knowledge of the subjects of musculoskeletal disease, prevention and research.
- Developing novel ways to engage the public and different socioeconomic groups. This includes engaging people in all aspects of the research process, such as setting the agenda for research questions that matter to them. This will help to ensure the research has relevance across the socioeconomic spectrum.
- Holding a free annual forum for people with a musculoskeletal condition, to find out more about prevention, treatment and diagnosis.

By working together to increase awareness and improve funding, we can lead the way in musculoskeletal research in Australia.

Key takeaway messages from the white paper:

1. Musculoskeletal conditions are the fourth-leading contributor to the burden of disease in Australia, affecting approximately 30% of the population.
2. 4 out of 5 people with musculoskeletal disease have at least one other chronic condition or co-morbidity such as CVD.
3. Musculoskeletal conditions contribute to 1 in 20 deaths, especially where there is co-morbidity such as heart disease or cancer.
4. Approximately 20% of YLD can be attributed to musculoskeletal conditions.
5. The conditions also represent about 41% of early retirements.
6. Musculoskeletal conditions account for almost 10% of healthcare expenses for all disease groups.
7. Musculoskeletal conditions are not just conditions affecting adults. Most have their origins in childhood and only manifest in adulthood. Therefore, there needs to also be a continued focus on paediatric bone health.
8. There are gaps in knowledge and awareness of musculoskeletal conditions amongst medical staff, students and the public which need to be addressed.
9. Data show the total disease burden of musculoskeletal conditions is approximately 12%. Despite this, less than 4% of healthcare grant funding is directed towards research into these conditions. At UoM in 2018, only 4% of healthcare grant funding was allocated to musculoskeletal conditions.
10. The inadequate level of research funding for musculoskeletal conditions acts as a barrier to effective and optimal research at the UoM and other institutions. Our proposed solutions include lobbying for increased investment in research funding, strengthening the profile of UoM and AIMSS as major research hubs, improving collaboration, communication and networking, and gaining public support.



Acknowledgments:

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Dr	Bow Tauro	University of Melbourne	Dr	Irina Churilov	St Vincent's Hospital
	Bradley Turner	University of Melbourne	A/Prof	Itamar Levinger	Victoria University
Prof	Brian Leury	University of Melbourne		Jack Bolton	Victoria University
A/Prof	Bronwyn Kingwell	University of Melbourne		Jack Feehan	University of Melbourne
	Canhvinh Nguyen	Victoria University	Dr	James Ryall	University of Melbourne
	Cassandra Smith	Victoria University		James Sorensen	Victoria University
	Catherine Giuliano	Victoria University		Jason Talevski	University of Melbourne
Dr	Catherine Ngan	University of Melbourne	Prof	Jeffrey Zajac	University of Melbourne
Dr	Cathy Drinkwater	BioCurate		Jenny McConnell	University of Melbourne
A/Prof	Cathy Said	University of Melbourne	Dr	Jeremy Cottrell	University of Melbourne
Dr	Cecil Hor	Western Health	Dr	Jesse Zanker	Western Health
Dr	Charles Pagel	University of Melbourne	Prof	Joan McMeeken	University of Melbourne
A/Prof	Chris Briggs	University of Melbourne	Prof	John Hamilton	University of Melbourne
Dr	Christian Barton	University of Melbourne	A/Prof	John Price	Victoria University
A/Prof	Christine Rodda	University of Melbourne	Dr	John Slavin	University of Melbourne
Dr	Claudia Dibella	University of Melbourne	Prof	John Wark	University of Melbourne
Dr	Craig Goodman	Victoria University	Prof	Jon Emery	University of Melbourne
Prof	Dallas English	University of Melbourne	Dr	Jonathan Gooi	University of Melbourne
A/Prof	Damian Myers	University of Melbourne		Joseph Polidano	University of Melbourne
	Danielle Debruin	Victoria University	Prof	Julie Bernhardt	University of Melbourne
Dr	David Ackland	University of Melbourne	A/Prof	Julie Pasco	University of Melbourne
Prof	David Hare	University of Melbourne	Dr	Justin Hardee	University of Melbourne
Dr	David Liew	University of Melbourne	Dr	Kade Paterson	University of Melbourne
Dr	David Scott	Monash University	Dr	Karen Borschmann	University of Melbourne
	Dean Campelj	Victoria University	Dr	Kate Murphy	University of Melbourne
Dr	Ebrahim Bani Hassan	University of Melbourne	Prof	Kathryn North	University of Melbourne
Prof	Ego Seeman	University of Melbourne	Dr	Kathryn Stok	University of Melbourne
Prof	Eleanor Mackie	University of Melbourne	Dr	Keith Lim	Western Health

Dr	Kelly Bower	University of Melbourne	Prof	Rana Hinman	University of Melbourne
Prof	Kerrie Sanders	University of Melbourne	Dr	Rene Koopman	University of Melbourne
Dr	Kevin Watt	University of Melbourne	Dr	Reza Sanaei	University of Melbourne
Dr	Khic-Houy Prang	University of Melbourne	Prof	Richard De Steiger	University of Melbourne
Prof	Kim Bennell	University of Melbourne	Prof	Richard Maclsaac	University of Melbourne
	Kleopatra Hondros	University of Melbourne	A/Prof	Richard Osborne	University of Melbourne
Dr	Kristy Swiderski	University of Melbourne	A/Prof	Robert Michail Ivan Kapsa	University of Melbourne
A/Prof	Kulmira Nurgali	Victoria University	Dr	Rodney Dilley	University of Melbourne
	Lavanya Murthy	Western Health	Dr	Ruth Park-Jones	University of Melbourne
A/Prof	Lyle Gurrin	University of Melbourne	Dr	Sandra Iuliano	University of Melbourne
A/Prof	Mandana Nikpour	University of Melbourne	Mrs	Sara Vogrin	University of Melbourne
Prof	Marcus Pandy	University of Melbourne		Shakya Dayaratne	Victoria University
	Mariam Hachem	University of Melbourne	A/Prof	Shane Hamblin	Western Health
Dr	Marissa Caldwell	University of Melbourne	A/Prof	Sharon Brennan-Olsen	University of Melbourne
Dr	Mark Gregory	University of Melbourne		Shenna Langenbach	University of Melbourne
A/Prof	Mark Kotowicz	Barwon Health		Shilpa Sharma	University of Melbourne
Prof	Mark Stevenson	University of Melbourne		Shirley Poon	University of Melbourne
Prof	Mary Galea	University of Melbourne		Solange Bernardo	Western Health
Prof	Mathis Grossmann	University of Melbourne	Prof	Steven Petrou	University of Melbourne
Dr	Michael Bullen	Western Health		Steven Phu	University of Melbourne
Prof	Michael McGuckin	University of Melbourne	Dr	Susan Berney	University of Melbourne
	Michael Mclaughlin	University of Melbourne		Thilinie De Silva	Western Health
Dr	Michelle Hall	University of Melbourne	Prof	Thomas Martin	University of Melbourne
Dr	Michelle Hansen	University of Melbourne		Tim Wrigley	University of Melbourne
Dr	Mizhgan Fatima	University of Melbourne		Timur Naim	University of Melbourne
Dr	Nancy Capitanio	University of Melbourne		Varsha Lal	University of Melbourne
Prof	Natalie Sims	University of Melbourne	Dr	Vivian Grill	Western Health
Dr	Nazanin Ghazanfari	University of Melbourne	Dr	Wen Wu	University of Melbourne
	Neide Alessandra Perigo Nascimento	Universidade Federal de São Paulo	Dr	Xu (Sean) Yan	Victoria University
	Nicolas Sopotro	University of Melbourne			
Prof	Nigel Stepto	Victoria University			
Dr	Nigel Toussaint	University of Melbourne			
A/Prof	Paul Gregorevic	University of Melbourne			
Prof	Paul Hodges	University of Melbourne			
	Paula Casas	University of Melbourne			
Dr	Peta Hitchens	University of Melbourne			
Prof	Peter Angus	University of Melbourne			
Prof	Peter Brooks	University of Melbourne			
Prof	Peter Choong	University of Melbourne			
Prof	Peter Lee	University of Melbourne			
Dr	Peter Simm	University of Melbourne			
Dr	Peter Vuillermin	University of Melbourne			
Mr	Phong Tran	Western Health			
A/Prof	Rachel Davey	University of Melbourne			
Dr	Rachel Duckham	Deakin University			
Dr	Rachel Thomson	University of Melbourne			

