



National Osteoarthritis Strategy

Developed by National Osteoarthritis
Strategy Project Group
November 2018

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Osteoarthritis (OA) is the **most common chronic joint disease** in Australia

1 in 6 Australians with osteoarthritis report **high or very high psychological distress**, over 5 times higher compared to those without the condition

2 in 3 people who have osteoarthritis are female



1 in 4 people with osteoarthritis self-report **fair or poor health**, twice as many as people without the condition

One in eight Australians are affected by osteoarthritis



38% rise in the rate of total knee replacements for osteoarthritis from 2005-06 to 2015-16



People with osteoarthritis are over 4 times more likely to report **very severe pain** (5.2%) compared to those without the condition (1.2%)

Nearly 100,000 Australians had joint replacements to treat osteoarthritis at an estimated cost of more than **\$2 billion** in 2016

Osteoarthritis cost the health system **\$3.75 billion** in 2012



More than 1 in 2 Australians with osteoarthritis report **moderate to very severe pain**



Preface

The National Osteoarthritis Strategy (the Strategy), prepared by the National Osteoarthritis Project Group, aims to provide a national response to osteoarthritis and to deliver major benefits to people at risk of, or with, osteoarthritis by making more effective, cost-effective and accessible healthcare solutions available to all Australians.

The Strategy identifies seven priority areas covering the whole person journey from prevention and early management to joint replacement or other surgery and rehabilitation, focusing on reducing the impact of osteoarthritis on individuals, families and the community. It is intended to provide an evidence-informed policy foundation on which practical and feasible implementation plans for osteoarthritis prevention and management are developed, and to guide government, other key stakeholders and organisations as to how existing limited healthcare resources can be better coordinated and targeted to achieve optimal outcomes for people.

Vision

To outline Australia's national response to osteoarthritis and inform how existing limited healthcare resources can be better coordinated and targeted to achieve optimal outcomes for people.

Specific objectives are identified against each key priority area in the Strategy. In broad terms the Strategy aims to:

- Guide the development, planning and implementation of osteoarthritis prevention and management through research, education for healthcare professionals and community, and best practice clinical services using a whole of population approach.
- Support the delivery of consistent, evidence-based strategy, to manage and minimise the impact and extent of osteoarthritis in the Australian community.
- Achieve agreement for a national implementation program to deliver the models of best-practice treatment and self-management of osteoarthritis.
- Make best-practice osteoarthritis management accessible to all Australians.

The National Osteoarthritis Strategy was initiated by the University of Sydney and Medibank Better Health Foundation. The Strategy has been developed over 2017-2018 by a leadership group, three working groups, an implementation committee, and stakeholders. It has been further refined through public consultation and submissions. The Strategy is launched at the National Osteoarthritis Summit in Canberra in November 2018, and progressed to a national implementation plan.

The Strategy has been designed to provide governments, non-government organisations, Primary Health Networks, health practitioners, community service providers and professional bodies with a national strategic plan and achievable implementation plans for more effective prevention and management of osteoarthritis. This initiative leads the way in Australia and internationally in osteoarthritis prevention, management and research.

Acknowledgements

The National Osteoarthritis Strategy is endorsed by Arthritis Australia, the Australian Rheumatology Association, the Australian Orthopaedic Association, the Australasian College of Sport and Exercise Physicians and the Australian Prevention Partnership Centre, with additional discussions with other organisations ongoing.



The Strategy builds on other national and state-wide strategies, including: Time to Move: Arthritis strategy [1], National Strategic Framework for Chronic Conditions [2], National Pain Strategy [3], A National Action Plan for Osteoarthritis, Rheumatoid Arthritis and Osteoporosis [4], Osteoarthritis of the Knee Clinical Care Standard [5], the Victorian Model of Care for Osteoarthritis of the Hip and Knee [6], the Royal Australian College of General Practitioners Guideline for the Management of Knee and Hip Osteoarthritis [7] and the New South Wales Health Leading Better Value Care Program [8]. The Strategy has also informed the recommendations of the National Strategic Action Plan for Arthritis, to be released in 2019.

This draft Strategy is a result of consultation and meetings with the Leadership and Working Groups and key multi-sectoral stakeholders. It benefits from the expertise and experience of a wide range of experts in the field. The enormous contributions from the Leadership, Working and Implementation Groups to the design and development of the Strategy, is greatly appreciated. The full list of the Leadership, Working and Implementation Groups and the project team can be found in Appendix G.

Special thanks to Medibank Better Health Foundation and the Australian Orthopaedic Association for financial support.

The National Osteoarthritis Strategy project team would also like to acknowledge the support of the National Health and Medical Research Council Centre of Research Excellence in Translational Research in Musculoskeletal Pain. We also wish to express sincere appreciation for the input and feedback from key stakeholder groups and acknowledge the assistance of all those who helped in the development of the Strategy.



Table of Content

Contents

1	EXECUTIVE SUMMARY	1
2	Introduction	4
2.1	The Burden of Osteoarthritis in Australia	4
2.2	Management of osteoarthritis	5
3	National Osteoarthritis Strategy	5
3.1	Why now?	5
3.2	Vision and Aims.....	6
3.3	Principles.....	6
3.4	Design and process	7
4	A Strategic Response.....	8
5	Implementation plans	11
5.1	Prevention	11
5.2	Living Well with Osteoarthritis	16
5.3	Advanced Care	22
5.4	Validation of Implementation plans.....	26
5.5	Stakeholder Analysis	26
6	Evidence-based Strategic Priorities.....	27
6.1	Evidence for Prevention.....	27
6.2	Evidence for Living Well with Osteoarthritis	27
6.3	Evidence for Advanced Care	28
7	Research Capacity Building	28
7.1	Research Agenda for Prevention	28
7.2	Research Agenda for Living Well with Osteoarthritis.....	28
7.3	Research Agenda for Advanced Care	29
7.4	Osteoarthritis National Data Strategy	29
8	Appendix	30
A.	Detailed Evidence-based Strategic Priorities	30
	Prevention	30
	Living Well with Osteoarthritis.....	33
	Advanced Care	36
B.	Enablers, Barriers and Horizon Opportunities	40
C.	Public Consultation	50
D.	Economic Analysis of the Strategy	51
	Economic cost of osteoarthritis	51
	Potential return on investment.....	54

E.	Environmental scan	56
	Available Public services and services from NGOs	56
	National-level services	56
	State-based services and Model of Care.....	57
	Services for special populations.....	60
	Rural and remote populations	60
	Aboriginal and Torres Strait Islander Populations.....	60
	Awareness-raising campaigns and strategies	61
	Capacity building programs	61
F.	Stakeholder List.....	62
G.	Members of the National Osteoarthritis Strategy Project Group	64
9	References	67

1 EXECUTIVE SUMMARY

Osteoarthritis is the most common chronic joint disease in Australia and one of the leading causes of pain and disability. Despite the tremendous burden this disease places on individuals, families, healthcare systems and society, the care that consumers receive is often fragmented and inappropriate.

The National Osteoarthritis Strategy has been developed to align with current Guidelines, Standards and jurisdictional Models of Care. It takes into account new evidence and feedback received from broad consultation both in Australia and internationally. It aims to outline a national response to osteoarthritis and inform how existing limited healthcare resources can be better coordinated to achieve optimal patient outcomes.

The Strategy takes a whole person journey approach from prevention and early management (including self-management) to joint replacement, other related surgery and rehabilitation. The Strategy sets seven priorities to guide the actions required under three thematic areas as depicted in Figure 1 (listed by numerical order, not relative importance).

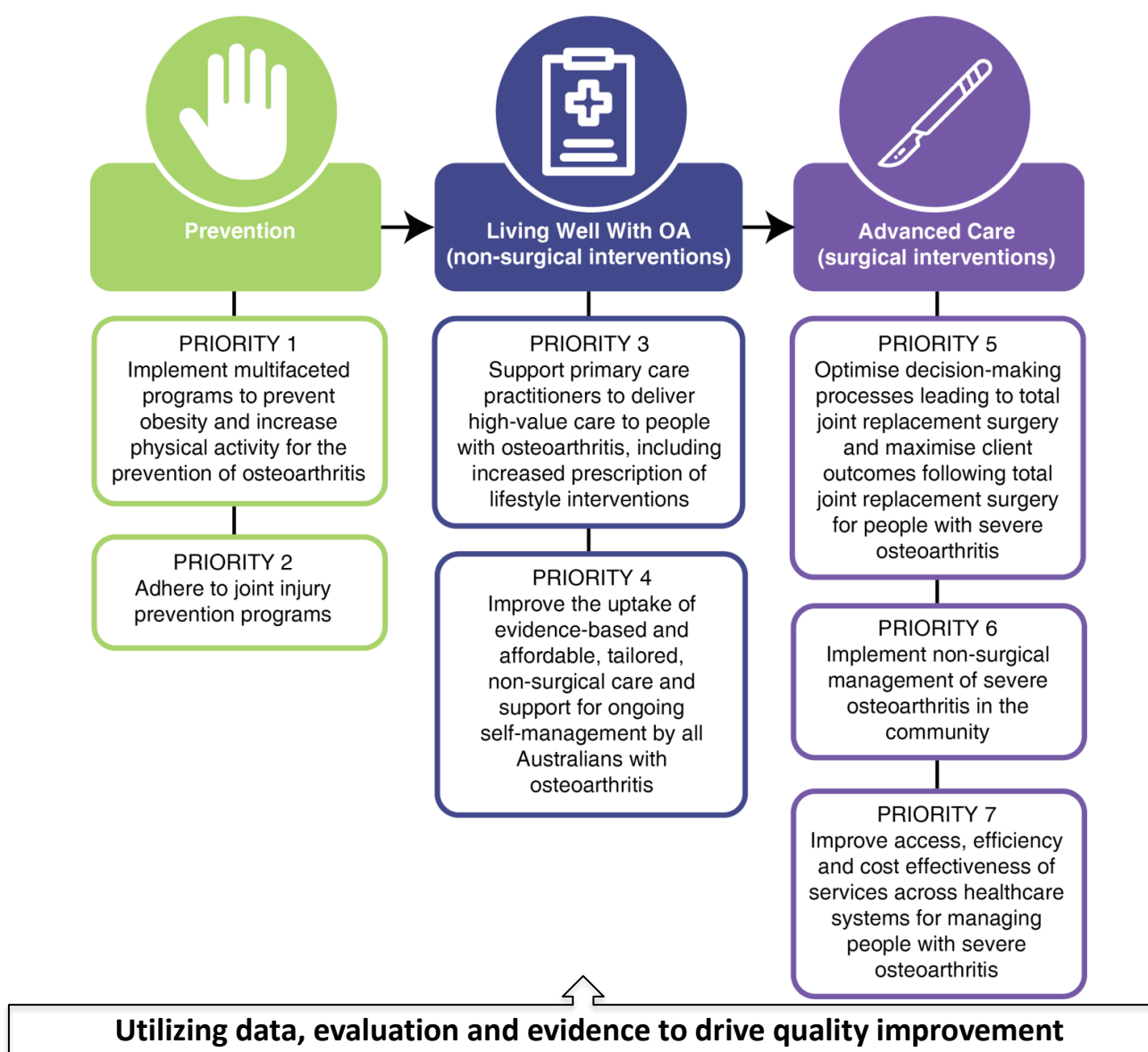


Figure 1 Summary of Priority Areas

Under each of the priority areas, the Strategy sets high-level directions for improvement with a set of goals:

Goals for Prevention

- Goal 1.1 Maintain healthy weight amongst the community to prevent osteoarthritis

- Goal 1.2 Raise structured (organised) and unstructured (incidental) moderate and vigorous physical activity levels by 15% for people of all ages by 2030 to prevent osteoarthritis
- Goal 2.1 Reduce knee injury rates from sporting participation by 25% by 2025 to prevent osteoarthritis

Goals for Living Well with Osteoarthritis

- Goal 3.1 At least 50% of Australians with osteoarthritis receive a recommendation from a healthcare practitioner to undertake evidence-based lifestyle and other self-management strategies to reduce pain and disability by 2025
- Goal 4.1 At least 50% of people with osteoarthritis are undertaking lifestyle and other self-management strategies to reduce pain and disability by 2025
- Goal 4.2 Ensure access to, and uptake of, lifestyle and other self-management strategies by people with osteoarthritis is equitable across geographic areas, socioeconomic levels and culturally and linguistically diverse groups

Goals for Advanced Care

- Goal 5.1 Optimise the shared decision-making process for joint replacement for both healthcare practitioners and people with severe osteoarthritis
- Goal 6.1 Promote the dissemination of information on evidence-based non-surgical management for people with severe osteoarthritis to the public, primary healthcare practitioners and specialist orthopaedic practitioners
- Goal 6.2 Enhance access to, and uptake of, effective non-surgical management for people with severe osteoarthritis
- Goal 7.1 Promote an efficient clinical pathway from diagnosis of severe osteoarthritis (in appropriate people for total joint replacement) to the execution of surgery
- Goal 7.2 Prioritise access to non-surgical management programs by people on the joint replacement waiting list

In order to achieve the above set of goals, the Strategy proposes **26 strategies** across the three thematic elements to guide the actions required to address the problematic areas under each priority.

Strategies for Priority 1: Implement multifaceted programs to prevent obesity and increase physical activity for the prevention of osteoarthritis

- 1.1 Support the development of the National Obesity Strategy by working closely with stakeholders and national obesity groups to change policy and practice to support obesity and osteoarthritis prevention.
- 1.2 Improve public awareness of the link between obesity and osteoarthritis
- 1.3 Work closely with national physical activity advocacy groups to influence change in policy and practice to increase physical activity levels for people of all ages
- 1.4 Promote greater physical activity levels in everyday life through community-based settings to prevent osteoarthritis

Strategies for Priority 2: Adhere to joint injury prevention programs

- 2.1 Work with sporting groups and those groups with an interest in sports injury prevention to develop and implement joint injury prevention programs
- 2.2 Work with executive boards of sports bodies and educators to promote the development, teaching and adoption of injury prevention programs
- 2.3 Audit and provide feedback on existing injury prevention programs to increase the adoption and fidelity of evidence-based programs
- 2.4 Utilise mainstream media to disseminate accurate information about injury prevention and development of osteoarthritis

Strategies for Priority 3: Support primary care practitioners to deliver high-value care to people with osteoarthritis, including increased prescription of lifestyle interventions

- 3.1 Improve the knowledge, skills and confidence of healthcare practitioners and students/trainees to provide high-value care for people with osteoarthritis (particularly effective delivery of 'first-line' evidence-based therapies) and support their effective self-management
- 3.2 Improve standards in osteoarthritis management by developing national benchmarking of outcomes of osteoarthritis programs and services
- 3.3 Develop and promote appropriate diagnostic tools for osteoarthritis

Strategies for Priority 4: Improve the uptake of evidence-based and affordable, tailored, non-surgical care and support for ongoing self-management by all Australians with osteoarthritis

- 4.1 Empower and support consumers with the knowledge and confidence to seek and request high-value care from healthcare practitioners and support self-management
- 4.2 Improve access to evidence-based exercise, weight loss and other pain management strategies
- 4.3 Provide access to timely interdisciplinary coordinated team care (remotely delivered or onsite) both in community and hospital settings for those individuals who require this level of care
- 4.4 Advocate for musculoskeletal health to be prominent in health policy and planning
- 4.5 Implement and support remotely-delivered evidence-based osteoarthritis services that embrace a biopsychosocial approach and support self-management
- 4.6 Implement outreach programs to promote high-value care to people living with osteoarthritis, their caregivers and healthcare professionals in regional and rural areas
- 4.7 Develop education and osteoarthritis management programs that are appropriate for and relevant to culturally and linguistically diverse groups

Strategies for Priority 5: Optimise decision-making processes leading to total joint replacement surgery and maximise client outcomes following total joint replacement surgery for people with severe osteoarthritis

- 5.1 Have structured patient decision-aids and education materials available for everyone considering total joint replacement
- 5.2 Ensure available decision aids are embedded in current practice
- 5.3 Embed patient information in decision aids to promote a shared decision-making process between patients and surgeons

Strategies for Priority 6: Implement non-surgical management of severe osteoarthritis in the community

- 6.1 Increase access to resources and awareness of evidence-based non-surgical management prior to considering surgery
- 6.2 Advocate for funding models (public and private) to support packages of care inclusive of exercise, weight loss, pain management and psychological health interventions, that align with people's needs, preferences and places of residence
- 6.3 Implement outpatient service models for non-surgical management of severe osteoarthritis

Strategies for Priority 7: Improve access, efficiency and cost effectiveness of services across healthcare systems for managing people with severe osteoarthritis

- 7.1 Ensure that total joint replacement surgery is provided, to those who need it, within timeframes consistent with current Australian policy on urgency categorisation
- 7.2 Ensure evidence-based non-surgical management has been accessed or completed by people with osteoarthritis before being placed on joint replacement waiting lists

The implementation of the above proposed strategies will require collaboration between a wide range of stakeholders across all health system sectors and beyond, including all levels of government, private sector partners, industry, service providers, health professionals, communities, professional bodies, not-for-profit organisations, consumer groups, non-government payers (including non-health insurers and individuals) and the education system. Engagement with these key stakeholders will continue over the course of the implementation process to ultimately ensure best-practice osteoarthritis management is accessible to all Australians.

2 Introduction

2.1 The Burden of Osteoarthritis in Australia

Osteoarthritis is the most common chronic joint disease and one of the leading causes of pain and disability in Australia and globally [9]. In 2015, osteoarthritis affected approximately 2.2 million people and they comprised 56.2% of the total arthritis population [10]. The prevalence of osteoarthritis is higher in Indigenous populations, in people living in regional areas, and in older populations [11]. However, osteoarthritis is not just a disease of older age: the majority of Australians living with osteoarthritis are 25–64 years old [12]. Osteoarthritis has been a National Health Priority Area since 2002 and identified as one of the top 20 conditions imposing the large burden of disease in Australia [13].

Osteoarthritis can have a profound impact on an individual's physical and mental health, quality of life, ability to engage in social, community and occupational activities and the economic prosperity of a society [13–15]. More than half of Australians with osteoarthritis reported experiencing 'moderate' to 'very severe pain' during 2014–15 [11]. People with osteoarthritis are 4.3 times more likely to report 'very severe pain' and 2.3 times more likely to report poor health, compared to those without the condition [11]. The risk of mobility impairment attributable to knee osteoarthritis alone is greater than that due to any other medical condition in people aged 65 years and over [16, 17].

Osteoarthritis is costly and has a strong economic impact. Osteoarthritis is estimated to have cost the Australian health system \$3.75 billion in 2012, with over half of these costs from joint replacements [1]. The rate of total knee replacements for osteoarthritis has risen by nearly 40% from 2005–2006 to 2015–2016 and the cost of hip and knee replacements is estimated to have increased by over \$80 million annually [1, 11, 18, 19]. Osteoarthritis is also a leading cause of early retirement. Of all Australians living with osteoarthritis aged between 45 and 64 years, it is estimated that half are currently not in the workforce, twice as many as those without the condition [1]. A loss of \$7.2 billion in GDP was estimated for 2015 due to the impact of arthritis on the labour force and the total economic cost of arthritis, including indirect costs such as lost work productivity and loss of wellbeing, is estimated to be over \$23 billion each year [20].

With an ageing and increasingly obese population, the prevalence of osteoarthritis in Australia is projected to soar. The number of Australians aged 65 and over is expected to increase rapidly, from 13% of the population in 2002 to 25% in 2042. There will only be 2.5 people of working age supporting each person aged over 65 by 2042, compared to 5 people in 2002 [21]. It is projected that the number of cases of osteoarthritis will increase to 3.0 million people by 2032 and the prevalence will increase by 41% in coming decades [12, 22].

The economic costs associated with osteoarthritis are expected to rise in the coming years at a faster rate than would be predicted by population growth alone. The associated consequences for the economy, productivity, health service and population health will also be immense [23]. To curb the exponential burden of osteoarthritis on individuals and communities, effective prevention and management of osteoarthritis and cost-effective health services are required.

- **The total economic cost of osteoarthritis, including indirect costs such as lost work productivity and loss of wellbeing, is estimated to be over \$23 billion each year**
- **By 2032, it is projected that the number of cases of osteoarthritis will increase to 3.0 million people**

2.2 Management of osteoarthritis

A range of health services are available for people at risk of, or with, osteoarthritis, including general practitioner (GP) services, allied health services, speciality care within the community, in-patient hospital care and community exercise groups [24]. Recommended first-line care for osteoarthritis includes individually tailored physical activity, self-management for osteoarthritis such as exercise and weight management, and psychological techniques.

Osteoarthritis in Australia is commonly managed by GPs, who also provide referrals to specialists, allied health services (e.g. physiotherapy, occupational therapy, exercise physiology, dietetics, social work), and imaging services where indicated.

Almost one in five GP referrals to an orthopaedic surgeon is for a person with osteoarthritis [25].

Osteoarthritis is also the third most common reason for referral for imaging (4.2% of requests [25]).

Psychological and behavioural pain management interventions can be used to improve emotional and behavioural wellbeing and to reduce pain intensity [26, 27]. In-patient care for people with osteoarthritis is delivered in both the public and private hospital systems. In 2016–2017, there were 341,591 admissions to public hospitals and 191,769 to private hospitals related to arthritis and osteoarthritis [28].

Funding for these healthcare services comes from the government, private health insurance and patient's out-of-pocket expenses [24]. The Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS) provide subsidies for medical care and medications for people with osteoarthritis, respectively. Only those who are under a General Practitioner Management Plan (GPMP) or Team Care Arrangement (TCA) for chronic conditions with a formal chronic care plan are eligible to access up to five Medicare-subsidised allied health services for the treatment of their osteoarthritis, or up to ten Medicare-subsidised allied health services if they are Aboriginal or Torres Strait Islander [29].

Despite the tremendous burden that osteoarthritis places on individuals, healthcare systems and society, osteoarthritis is poorly managed in Australia. Two-thirds of people with osteoarthritis report that they are faring badly with their condition [30]. In 2009–10, 57% of people with osteoarthritis reportedly did not receive appropriate care for their condition as recommended by current guidelines [31]. Co-morbidity is another significant issue associated with effective management of osteoarthritis—approximately 75% Australians living with arthritis also have another co-morbid condition, such as cardiovascular disease, back problems and mental health conditions [32]. Most GPs report dissatisfaction with the care they can provide to people with osteoarthritis due to the limited effectiveness of current treatment options [33]. Management is further compromised by limited knowledge about the causes of osteoarthritis and an absence of a cure or effective intervention to slow its progression.

Recommended first-line care for osteoarthritis:

- Individually tailored physical activity
- Self-management such as exercise and weight management
- Psychological techniques

3 National Osteoarthritis Strategy

3.1 Why now?

People in Australia both at risk of, or with osteoarthritis, often receive fragmented and inappropriate care. The fragmentation of care has created perverse incentives to over-treat osteoarthritis with expensive interventions that often represent low-value care. There have been some attempts to improve the alignment of practice with contemporary evidence, but these have been piecemeal and not systematic. Recently a number of key initiatives have been launched, which could have a favourable impact on osteoarthritis

management, especially in a fiscally constrained environment. These include: the Medicare Benefits Schedule (MBS) review, the introduction of Medical Research Future Fund funding to support translational research and implementation, development of the Osteoarthritis of the Knee Clinical Care Standard [34], launch of the Victorian Osteoarthritis Model of Care [6], revision of the Royal Australian College of General Practitioners (RACGP) guideline for osteoarthritis management [7], NPS MedicineWise osteoarthritis initiatives [35], and launch of the New South Wales Agency for Clinical Innovation and Ministry of Health Leading Better Value Care (LBVC) Initiative [8].

Osteoarthritis treatment should be evidence-based and tailored to the individual. Education and information delivered to people about the appropriate management of osteoarthritis should also be based on evidence. There are relatively limited opportunities for services in Australia to obtain assistance to implement effective psychological pain management services. The effectiveness of osteoarthritis care should be measured in terms of patient outcomes, not volume, and this paradigm shift is key to achieving appropriate rates of investigation and delivery of high-value care. Similarly, osteoarthritis research is siloed, has limited capacity and nationally does not follow a coherent plan that is centred on person and population needs.

Considering the increasing individual and societal burden from osteoarthritis, along with inappropriate clinical practices, it is critical that effective strategies are implemented to improve prevention, care and research for people with osteoarthritis and the broader population. A cohesive, unified, clear direction that is not fragmented or informed by anecdote is needed.

3.2 Vision and Aims

The vision of the National Osteoarthritis Strategy is to outline Australia's national response to osteoarthritis and inform how existing limited healthcare resources can be better coordinated and targeted to achieve optimal outcomes for people.

Reflecting this vision, this report proposes a set of strategies for effective osteoarthritis prevention and management using a whole person approach. It aims to manage and minimise the impact and extent of osteoarthritis in the Australian community, deliver models of best practice treatment and self-management of osteoarthritis and make best osteoarthritis management accessible to all Australians.

3.3 Principles

The National Osteoarthritis Strategy has been developed to align with current Guidelines, Standards Models of Care and a range of Commonwealth, state and local government initiatives. The methodology used to develop the strategy considers new evidence, best practice and feedback from a broad consultative process undertaken across Australia. The following principles have guided the development of the Strategy:

- A biopsychosocial approach to the prevention and management of the disability associated with osteoarthritis which necessarily goes beyond biomedical factors to include the psychological, environmental and social factors affecting people living with, or at risk of, osteoarthritis.
- A patient/consumer-centred approach, which embraces patient education and supports active and effective self-management.
- Inter-professional collaboration and best-practice, evidence-based clinical care, aimed at achieving optimal outcomes for people.
- A focus on innovation and new technologies, and approaches such as big data modelling and personalised medicine.

The Strategy employs a whole person journey method from prevention and early management (including self-management) to joint replacement, other related surgery and rehabilitation, focusing on individual and

community impact (Figure 2). This approach has been used successfully to develop the National Pain Strategy [3], the National Diabetes Strategy [36] and the National Plan for Child and Youth Wellbeing [37]. These strategies have been instrumental in raising awareness of the prevalence and socioeconomic burden of these conditions and developing clear and strategic implementation plans to achieve systematic improvement.

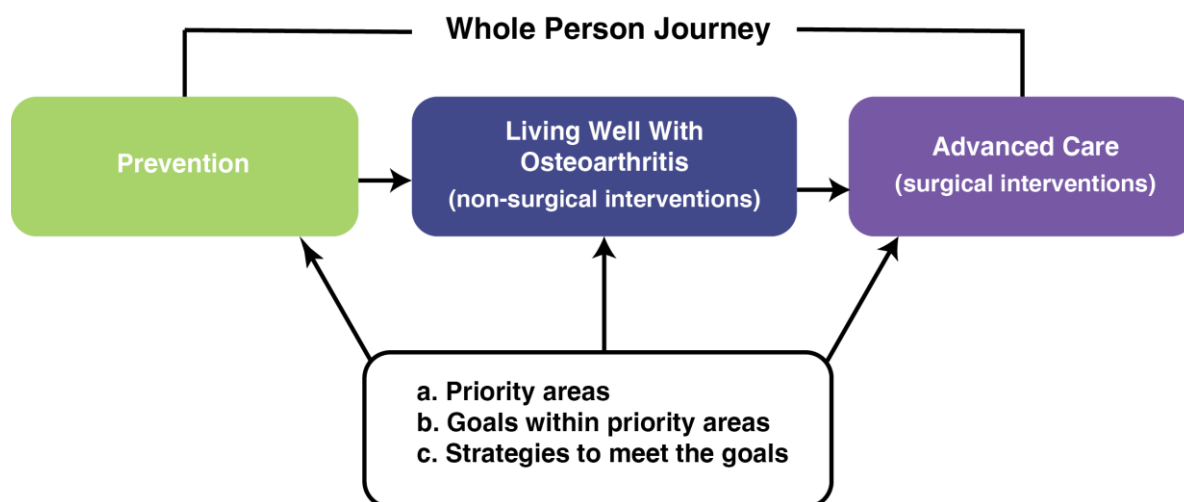


Figure 2 the Whole Person Journey Method

3.4 Design and process

The design and development of the Strategy involved 5 stages.

1. Formation of a Strategy Leadership Group

The Strategy Leadership Group (Figure 3) provided the strategic framework and work plan for the National Osteoarthritis Strategy, oversaw the preparation of the Strategy, provided guidance, led the consultation process and reviewed the draft Strategy. It will further mobilise support and financial resources for the implementation of the Strategy. The Leadership Group comprised representatives of osteoarthritis disciplines, GP's and other primary care practitioners, advocacy groups of the Australian healthcare system and consumers.

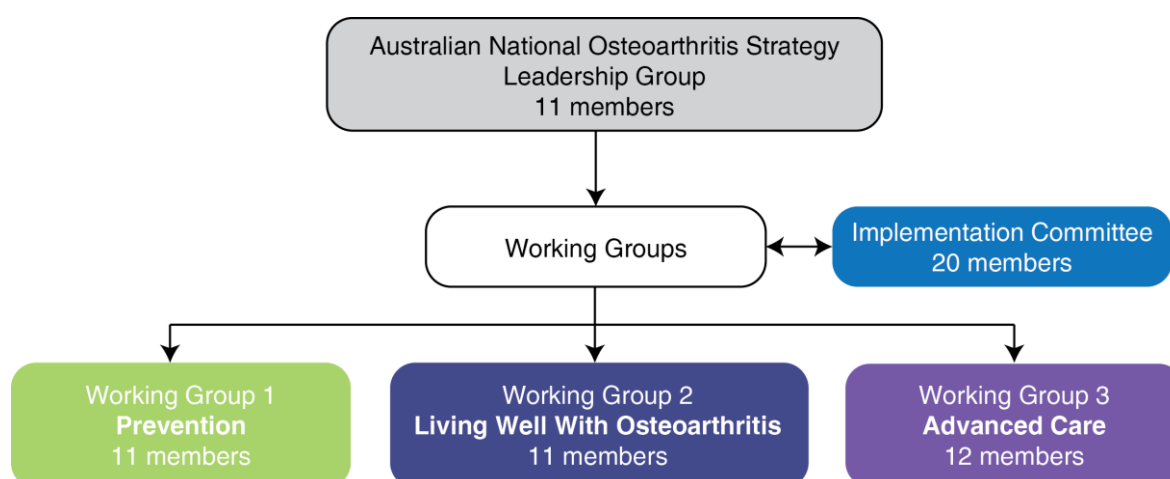


Figure 3 Structure of National Osteoarthritis Strategy Project Group

2. Working Group actions

Three Working Groups worked in parallel with a specific focus according to the disease course of osteoarthritis and led the identification of priority areas, goals within priority areas and strategies to meet the goals. The working groups covering the three key phases of a person's journey are:

- 1) *Prevention* Working Group: osteoarthritis prevention;

- 2) *Living Well With Osteoarthritis* Working Group: non-surgical interventions including detection, diagnosis and early care;
- 3) *Advanced Care* Working Group: surgical interventions.

3. Development of the National Osteoarthritis Strategy

The Strategy is developed using contemporary evidence and recommendations by the Working Groups. Key elements of the Strategy include prioritised issues, goals, strategies and implementation plans for the three key phases. In addition, the Strategy has been informed by face-to-face consultations with identified stakeholders and online public consultation.

4. 2018 National Osteoarthritis Summit

The Strategy is presented to wider stakeholder groups at the 2018 Osteoarthritis Summit in Canberra in November 2018 for consultation and validation to ensure an effective, comprehensive and transparent consultation process. The Summit also formalises the Strategy and progresses the thinking/efforts to a set of national implementation plans.

5. Implementation: financial analysis, communication and advocacy

An implementation Committee has been formed to assess the Strategy's recommendations from a financial perspective with economic modelling and evaluation, highlighting the high cost of current osteoarthritis management and resulting consequences of implementing the National Osteoarthritis Strategy.

The Strategy and the National Strategic Action Plan for Arthritis will also be used as companion documents to advocate all levels of government to improve the prevention and management of both osteoarthritis and other forms of arthritis in Australia.

4 A Strategic Response

The Strategy takes a whole person journey approach from prevention and early management (including self-management) to joint replacement or other related surgery and rehabilitation. It identifies seven priority areas (Figure 4) and 26 strategies (Table 1) across the three thematic elements to guide the actions required. The Implementation Committee recommended that these strategies are implementable immediately, but some may take longer to achieve than others. The strategies are displayed in Table 1 based on the likely time frames required to achieve the change: short-term (until 2020), medium-term (until 2023) and long-term (until 2027). The detailed implementation plans with actions required and objectives to achieve for each of the Strategies are elaborated in Section 5 of the document.

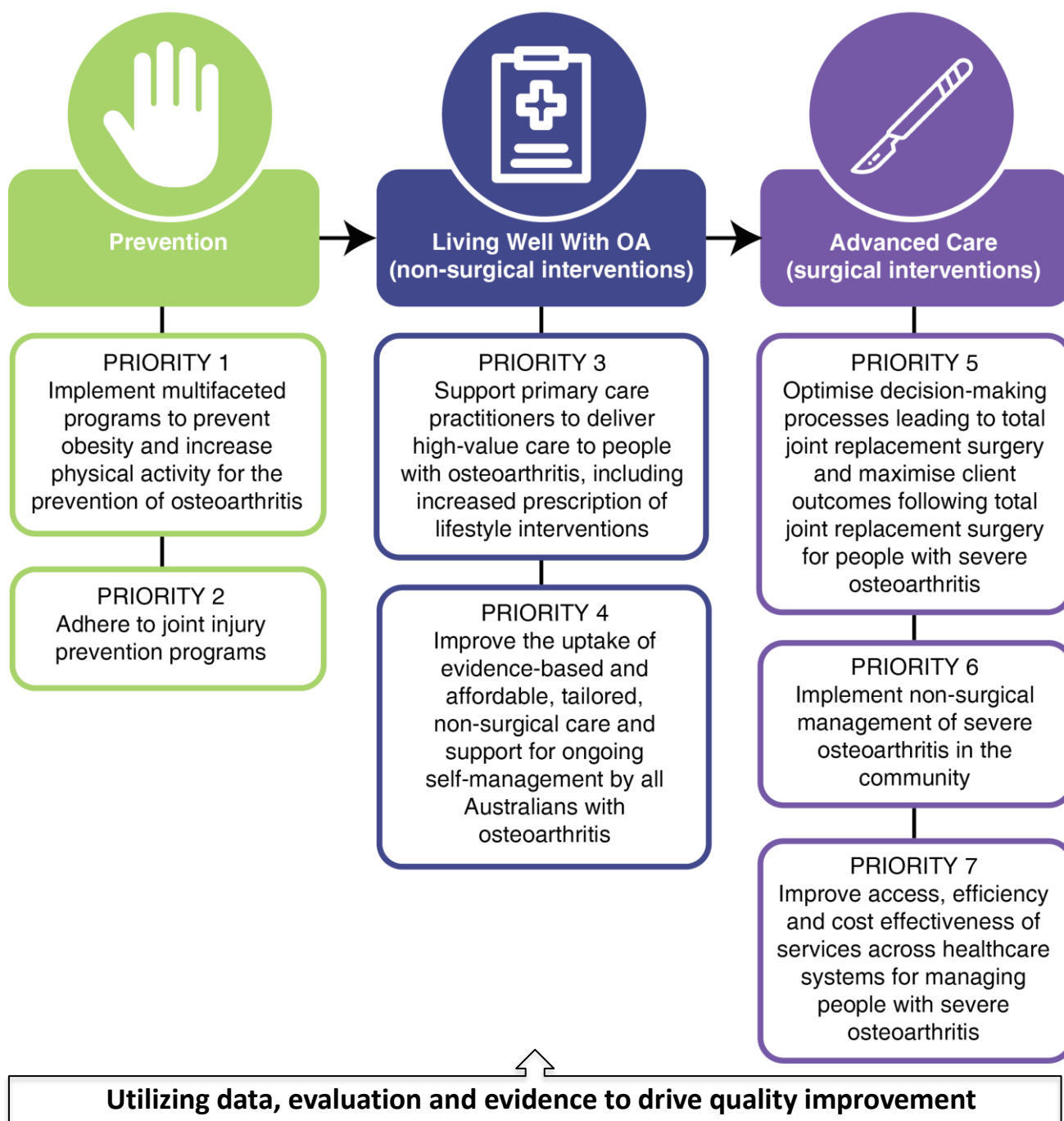


Figure 4 Summary of Priority Areas

Table 1 Strategies proposed to tackle the problems under the seven priority areas

	Short-term (until 2020)	Medium-term (until 2023)	Long-term (until 2027)
Prevention	2.4 Utilise mainstream media to disseminate accurate information about injury prevention and development of osteoarthritis	1.2 Improve public awareness of the link between obesity and osteoarthritis 1.3 Work closely with national physical activity advocacy groups to influence change in policy and practice to increase physical activity levels for people of all ages 2.1 Work with sporting groups and those groups with an interest in sports injury prevention to develop and implement joint injury prevention programs 2.2 Work with executive boards of sports bodies and educators to promote the development, teaching and adoption of injury prevention programs 2.3 Audit and provide feedback on existing injury prevention programs to increase the adoption and fidelity of evidence-based programs	1.1 Support the development of the National Obesity Strategy by working closely with stakeholders and national obesity groups to change policy and practice to support obesity and osteoarthritis prevention. 1.4 Promote greater physical activity levels in everyday life through community-based settings to prevent osteoarthritis
Living Well with Osteoarthritis		3.2 Improve standards in osteoarthritis management by developing national benchmarking of outcomes of osteoarthritis programs and services 3.3 Develop and promote appropriate diagnostic tools for osteoarthritis 4.1 Empower and support consumers with the knowledge and confidence to seek and request high-value care from healthcare practitioners and support self-management 4.4 Advocate for musculoskeletal health to be prominent in health policy and planning 4.5 Implement and support remotely-delivered evidence-based osteoarthritis services that embrace a biopsychosocial approach and support self-management 4.6 Implement outreach programs to promote high-value care to people living with osteoarthritis, their caregivers and healthcare professionals in regional and rural areas 4.7 Develop education and osteoarthritis management programs that are appropriate for and relevant to culturally and linguistically diverse groups	3.1 Improve the knowledge, skills and confidence of healthcare practitioners and students/trainees to provide high-value care for people with osteoarthritis (particularly effective delivery of 'first-line' evidence-based therapies) and support their effective self-management 4.2 Improve access to evidence-based exercise, weight loss and other pain management strategies 4.3 Provide access to timely interdisciplinary coordinated team care (remotely delivered or onsite) both in community and hospital settings for those individuals who require this level of care
Advanced Care	5.1 Have structured patient decision-aids and education materials available for everyone considering total joint replacement	5.2 Ensure available decision aids are embedded in current practice 5.3 Embed patient information in decision aids to promote a shared decision-making process between patients and surgeons 6.2 Advocate for funding models (public and private) to support packages of care inclusive of exercise, weight loss, pain management and psychological health interventions, that align with people's needs, preferences and places of residence 6.3 Implement outpatient service models for non-surgical management of severe osteoarthritis 7.2 Ensure evidence-based non-surgical management has been accessed or completed by people with osteoarthritis before being placed on joint replacement waiting lists	6.1 Increase access to resources and awareness of evidence-based non-surgical management prior to considering surgery 7.1 Ensure that total joint replacement surgery is provided, to those who need it, within timeframes consistent with current Australian policy on urgency categorisation

5 Implementation plans

The National Osteoarthritis Strategy will be used as the core advocacy document to be presented to all levels of government, local communities and key stakeholders to represent the interests of people with osteoarthritis in Australia. The following implementation priorities inform what should be undertaken by multiple stakeholders across the sector in partnership with government to improve health outcomes for Australians.

Some of the recommendations for the themes of *Living Well with Osteoarthritis* intentionally overlap with those for *Advanced Care*, reinforcing the critical importance of prioritising non-operative management strategies. The superscript symbols denote the strategies that are aligned with [the National Pain Strategy](#) ^(#) and [the Victorian Model of Care for Osteoarthritis](#) ^(^).

5.1 Prevention

Priority 1	
Implement multifaceted programs to prevent obesity and increase physical activity for the prevention of osteoarthritis	
Goal 1.1	Maintain healthy weight amongst the community to prevent osteoarthritis
Indicator(s) for monitoring	<ul style="list-style-type: none"> • The proportion of Australians with a body mass index within the healthy range • The difference in the proportion of Australians with a body mass index within the healthy range between the first and fifth quintile of the socio-economic index for areas (SEIFA) • The links between osteoarthritis and obesity explicitly highlighted in relevant obesity groups' strategies and policies
Strategy 1.1	Support the development of the National Obesity Strategy by working closely with stakeholders and national obesity groups to change policy and practice to support obesity and osteoarthritis prevention.
Objectives <ul style="list-style-type: none"> • Identify and implement existing obesity prevention and management plans and policies • Increase access to weight loss therapies in community settings • Raise public awareness about the health risks associated with obesity • Integrate musculoskeletal health and ageing into the National Obesity Strategy 	Implementation <ul style="list-style-type: none"> • Engage with stakeholders including national obesity groups (e.g. Obesity Policy Coalition, Obesity Australia, and Australian and New Zealand Obesity Society) and government to influence development and implementation of the National Obesity Strategy as well as other obesity prevention and management efforts to: <ul style="list-style-type: none"> ○ identify strategies to support the implementation of the recommendations of the 'Tipping the Scales' report and other obesity prevention policies and programs; ○ support access to community-based weight loss therapies for people with osteoarthritis; ○ support health professionals to increase awareness of obesity risks and management among their patients; ○ support and lobby for legislation for 'front of package' labelling and/or sugar tax. Initially, high-risk foods should be prioritised and

<p>and other related programs</p> <ul style="list-style-type: none"> • Advocate for legislation to 'front of package • Interpretive labelling to provide information to support informed consumer choice in purchasing • Widely communicate the need for osteoarthritis prevention based on the cost to health services from obesity 	<p>appropriate governance established to overcome unhelpful commercial influence.</p> <ul style="list-style-type: none"> • Identify high-risk groups for obesity and specifically target an education campaign to increase their awareness on the importance of exercise, diet, lifestyle choices and the association between obesity and osteoarthritis. • Develop economic models to demonstrate cost savings associated with osteoarthritis prevention in terms of obesity management.
Strategy 1.2	Improve public awareness of the link between obesity and osteoarthritis
<p>Objectives</p> <ul style="list-style-type: none"> • Develop and deliver community awareness-raising campaigns to highlight: <ul style="list-style-type: none"> ○ the link between obesity and osteoarthritis, ○ the understanding of energy balance, and ○ the importance of physical activity and healthy eating • Develop a national policy to overcome the obesogenic environment 	<p>Implementation</p> <ul style="list-style-type: none"> • Engage with national obesity groups (e.g. Obesity Policy Coalition, Obesity Australia, and Australian and New Zealand Obesity Society) and government activity related to obesity prevention and management to: <ul style="list-style-type: none"> ○ ensure musculoskeletal health is explicitly represented and the link between obesity and osteoarthritis clearly acknowledged and communicated; ○ ensure the concept of energy balance is communicated to the health workforce and volunteers. • Establish consortia groups to work with all levels of government to develop and implement policies and legislation that change the current obesogenic environments. • Work with social media and other communication channels to (e.g. healthcare body, gym and sports clubs) to disseminate evidence for the link between osteoarthritis and obesity and to promote physical activity.
Goal 1.2	Raise structured (organised) and unstructured (incidental) moderate and vigorous physical activity levels by 15% for people of all ages by 2030 to prevent osteoarthritis
Indicator(s) for monitoring	<ul style="list-style-type: none"> • Population-based physical activity participation (time) • Number of people undertaking different levels of physical activity
Strategy 1.3	Work closely with national physical activity advocacy groups to influence change in policy and practice to increase physical activity levels for people of all ages
Objectives	<p>Implementation</p> <ul style="list-style-type: none"> • Work with national physical activity groups to support the implementation of physical activity guidelines.

<ul style="list-style-type: none"> ● Implement national physical activity guidelines ● Place prevention of osteoarthritis into the agenda of national physical activity promotion groups ● Advocate for legislation to increase physical activity in schools 	<ul style="list-style-type: none"> ● Partner with Exercise and Sports Science Australia, the Heart Foundation and Obesity Australia and develop combined white papers and place prevention of osteoarthritis on to their agenda while collaborating on their existing programs (e.g. Australian Government Healthy Kids, Heart Foundation Get Active, Health and Physical Activity Day). ● Reinforce the importance of physical activity amongst students and parents and shift the society culture and have this embedded in and supported by Australia's Physical Activity and Sedentary Behaviour Guidelines for Children (5-12 years) and Australia's Physical Activity and Sedentary Behaviour Guidelines for Young People (13-17 years). ● Engage decision makers, state and local governments (councils), schools, workplaces and advocates of musculoskeletal health to drive policy to develop infrastructure and other initiatives that promote structured and unstructured physical activities (e.g. through Leader Local Grants).
Strategy 1.4	Promote greater physical activity levels in everyday life through community-based settings to prevent osteoarthritis
Objectives <ul style="list-style-type: none"> ● Raised awareness of the importance of physical activity ● Promote participation in physical activity (structured and unstructured) and reduce sedentary behaviours at schools and workplaces ● Increase access to low-cost sporting activities by all age groups 	Implementation <ul style="list-style-type: none"> ● Conduct awareness-raising campaigns about the importance of physical activity and provide local programs to encourage communities to be physically active from early childhood/education through to workplaces, collaborating with appropriate professionals (e.g. sports psychologists) to develop the programs. ● Work with primary healthcare providers to establish systems and measures to include a measurement of physical activity levels at every primary health consultation. ● Establish physical activity as part of routine activities in school, for example, exercise as the start of classes for everyone every day and provide teachers with the right tools and skills in facilitating such exercise sessions to make physical activity enjoyable. ● Improve infrastructures such as bike paths and walking trails and public transport systems to promote physical activity. ● Invest in safe exercise areas in communities and develop easy-to-follow, self-directed physical activity programs.

Priority 2	
Adhere to joint injury prevention programs	
Goal 2.1	Reduce knee injury rates from sporting participation by 25% by 2025 to prevent osteoarthritis
Indicator(s) for monitoring	Reduction in knee injury rates from sporting participation
Strategy 2.1	Work with sporting groups and those groups with an interest in sports injury prevention to develop and implement joint injury prevention programs

<p>Objectives</p> <ul style="list-style-type: none"> • Develop a school-age joint injury prevention program • Implement joint injury prevention programs • Raise awareness of the development of osteoarthritis and its consequences amongst young population groups 	<p>Implementation</p> <ul style="list-style-type: none"> • Form partnerships with key stakeholders, including academic and professional bodies (e.g. Australian Football League) to develop a school-age injury prevention program based on established successful programs (e.g. FootyFirst program, the Fédération Internationale de Football Association (FIFA 11+) and to sponsor and endorse sports specific changes that can prevent injuries (e.g. the rule change by the Australian Football League for posterior cruciate ligament injury prevention). • Engage with organisations beyond government (e.g. private sector) to assist with the implementation of joint injury prevention programs (e.g. making sports injury prevention a clearly stated goal, setting targets for lowering of risk of sport injuries and funding sports injury prevention programs through technology-enabled training programs, such as Sport 2030 within the Sport Australia initiatives). • Develop and evaluate technologies for injury prevention programs, particularly targeting people over 30-year old with ACL tears or other knee damage. • Target young people engaged in sport, implement early training (including in schools) to develop good habits for sports injury prevention and demonstrate the possible development of the disease at a young age. • Engage sporting groups that have already implemented injury prevention programs (e.g. soccer, netball) to champion initiatives that encourage exercise and structured physical activity to reduce injury. • Offer education on joint injury prevention to allied health providers, such as physiotherapists or pharmacists.
<p>Strategy 2.2</p>	<p>Work with executive boards of sports bodies and educators to promote the development, teaching and adoption of injury prevention programs</p>
<p>Objectives</p> <ul style="list-style-type: none"> • Build cross-sector partnerships to develop, teach and adopt injury prevention programs • Change the attitude and behaviours in coaches towards the importance of injury prevention programs • Institute training for implementing injury prevention programs in undergraduate, postgraduate programs and ongoing professional training 	<p>Implementation</p> <ul style="list-style-type: none"> • Collaborate with School Engagement and Partnerships at Sport Australia, elite national sporting associations (e.g. AFL, Soccer, Rugby, Netball) and Department of Education and Training to build cross-sector partnerships to <ul style="list-style-type: none"> ○ promote the implementation of injury prevention programs into school curriculums (e.g. AFL coaching, athletics and sports programs); ○ re-introduce more physical activity in primary schools emphasising safe movements in sports, balance and body movement activities to reduce injury. • Advocate for investment in strength and balance training focusing on injury and falls prevention in aged care and retirement settings. • Develop training programs for coaches (e.g. train the trainer programs) and exercise professionals and have this incorporated into the coaching accreditation schemes to successfully implement injury prevention programs. Within these programs, there should be

	<p>targeted interventions to educate and change attitudes and behaviours of coaches related to joint injury prevention.</p> <ul style="list-style-type: none"> ● Approach academic training institutions and professional peak bodies (e.g. the Australian Council for Health, Physical Education and Recreation, Exercise and Sports Science Australia, the Australian Physiotherapy Association) to institute training in implementing injury prevention programs, to audit current practice around the teaching of these programs within the academic curriculum of these professions. ● Develop data-driven communication resources that can be presented to executive level groups that demonstrate the scope of the problem of joint injury and its sequelae.
Strategy 2.3	Audit and provide feedback on existing injury prevention programs to increase the adoption and fidelity of evidence-based programs
<p>Objectives</p> <ul style="list-style-type: none"> ● Develop a National Sports Injury Database to <ul style="list-style-type: none"> ○ provide the basis for developing injury prevention programs ○ measure the effectiveness of current and new injury prevention programs ○ provide feedback of the effectiveness to the key stakeholders and ○ identify high-risk recreational and professional sports 	<p>Implementation</p> <ul style="list-style-type: none"> ● Collaborate with key stakeholders in the development of the Safe Sports Australia program and a National Sports Injury Database (\$6 million budgeted by the aim to provide evidence of the effectiveness of current and new injury prevention programs and to the federal government in 2018/19 budget). ● Develop an auditing mechanism for the quality and content of injury prevention programs. ● Build in mechanisms to quickly update existing injury prevention programs and ensure the distribution of the update. ● Increase awareness of the contents and effectiveness of injury prevention programs among professionals and sporting bodies that have oversight of these programs.
Strategy 2.4	Utilise mainstream media to disseminate accurate information about injury prevention and development of osteoarthritis
<p>Objectives</p> <ul style="list-style-type: none"> ● Raise public awareness of the links between injury, prevention, and osteoarthritis 	<p>Implementation</p> <ul style="list-style-type: none"> ● Make the link between injury and osteoarthritis evident through targeted national media campaigns. ● Educate people (e.g. athletes, volunteers, trainers) involved in competitive sports about injury prevention to promote a culture change in sports professionals and the general public through mainstream media. ● Identify injury prevention program champions and notable sports stars with osteoarthritis to promote the importance of injury prevention and the link between injury and development of osteoarthritis.

5.2 Living Well with Osteoarthritis

Priority 3	Support primary care practitioners to deliver high-value care to people with osteoarthritis, including increased prescription of lifestyle interventions
Goal 3.1	At least 50% of Australians with osteoarthritis receive a recommendation from a healthcare practitioner to undertake evidence-based lifestyle and other self-management strategies to reduce pain and disability by 2025
Indicator(s) for monitoring	Percentage of Australians with osteoarthritis who receive a recommendation to undertake lifestyle and other self-management strategies
Strategy 3.1	Improve the knowledge, skills and confidence of healthcare practitioners and students/trainees to provide high-value care for people with osteoarthritis (particularly effective delivery of 'first-line' evidence-based therapies) and support their effective self-management
Objectives <ul style="list-style-type: none"> Identify knowledge and skills gaps of primary care practitioners, independent medical examiners and trainees regarding high-value care for people with osteoarthritis Improve training of healthcare workforce in evidence-based osteoarthritis and chronic disease management Upskill other potential workforce practitioners in high-value OA care delivery Improve information and technology infrastructure for decision support and outcomes measures by healthcare practitioners Collaborate with other organisations to develop self-management programs 	Implementation <ul style="list-style-type: none"> Develop and promote skills-based core competencies in evidence-based osteoarthritis care across clinical groups, care settings, and all levels of professional practice in collaboration with professional bodies and consumers. These competencies must also consider culturally sensitive care delivery for Aboriginal and Torres Strait Islander peoples and culturally and linguistically diverse populations.[^] Establish and maintain an online repository of existing (and emerging) evidence-based, trans-disciplinary osteoarthritis and chronic disease management educational and training resources informed by consumer expertise, including clinical practice tools, for healthcare practitioners and trainees. Improve training of the emerging healthcare workforce and practising clinicians in evidence-based osteoarthritis and chronic disease management by: <ul style="list-style-type: none"> supporting Universities to audit the adequacy of their curricula in the evidence-based management of musculoskeletal conditions and persistent pain, based on established competencies and care standards; embedding effective training resources within the curricula of Australian university courses commencing at undergraduate programs; and developing, and promoting training courses on osteoarthritis and chronic disease management through the Royal Australian College of General Practitioners, Australian College of Rural and Remote Medicine, Primary Health Networks and other professional bodies such as the Australian Primary Health Care Nurses Association and Pharmaceutical Society of Australia. Work with insurance agencies and regulatory authorities to ensure independent medical examiners meet competency standards for

and accredited physical activity programs	<p>assessment and management of osteoarthritis and are supported to make recommendations on funding high-value care options for injured Australians.</p> <ul style="list-style-type: none"> ● Tailor upskilling strategies to support other potential workforce practitioners, such as fitness professionals, aged care workers and lay peer mentors to provide education, exercise, pain management and weight loss support in community settings for people with osteoarthritis. The opportunities should also extend to the unpaid workforce, such as volunteers and carers. ● Provide information and technology infrastructure for decision support and outcomes measurement by healthcare practitioners by promoting existing evidence-based decision support and information systems and advocating for a national standardised electronic medical report system. ● Openly communicate with Primary Health Networks, the relevant medical colleges, Arthritis state offices across the country, consumers, stakeholders, peak bodies and insurers to develop a multidisciplinary steering group to promote/implement self-management programs and accredited physical activity programs.
Strategy 3.2	Improve standards in osteoarthritis management by developing national benchmarking of outcomes of osteoarthritis programs and services
Objectives <ul style="list-style-type: none"> ● Develop minimal standards and competencies in musculoskeletal care ● Evaluate current osteoarthritis programs and services 	Implementation <ul style="list-style-type: none"> ● Develop minimal standards and competencies in musculoskeletal care that are nationally accepted. ● Implement key performance indicators to evaluate osteoarthritis programs and services that align with the Australian Commission on Safety and Quality in Health Care Clinical Care Standards [38] and relevant guidelines such as those from the Royal Australian College of General Practitioners. ● Utilise findings from existing state-based programs (e.g. Osteoarthritis Chronic Care Program in NSW) and formulate national benchmarking of outcomes. ● Include elements of this strategy for inclusion in the Quality Improvement Practice Payment proposed for General Practice commencing in May 2019.
Strategy 3.3	Develop and promote appropriate diagnostic tools for osteoarthritis
Objectives <ul style="list-style-type: none"> ● Develop appropriate diagnostic tools for primary care settings 	Implementation <ul style="list-style-type: none"> ● Develop and advocate using appropriate diagnostic tools in primary care settings. For example, uncomplicated osteoarthritis may require only a clinical history and examination.

Priority 4	Improve the uptake of evidence-based and affordable, tailored, non-surgical care and support for ongoing self-management by all Australians with osteoarthritis
Goal 4.1	At least 50% of people with osteoarthritis are undertaking lifestyle and other self-management strategies to reduce pain and disability by 2025
Indicator(s) for monitoring	Percentage of Australians with osteoarthritis that has been recommended to undertake lifestyle and other self-management strategies
Strategy 4.1	Empower and support consumers with the knowledge and confidence to seek and request high-value care from healthcare practitioners and support self-management[^]
Objectives <ul style="list-style-type: none"> ● Emphasise effective management of osteoarthritis ● Build a central resource repository for consumers and evidence-based resources for different settings ● Deliver education program and support for self-management in primary care 	Implementation <ul style="list-style-type: none"> ● In collaboration with consumers, develop and deliver public health messages about effective management of osteoarthritis specifically, disseminated through a mass media campaign, new government policy (e.g. Find your 30) and non-government organisations. It is critical that the role of physical activity in the management of osteoarthritis is made explicit in order to overcome widespread public misconceptions.[^] ● Establish and maintain a resources hub/web platform for consumers where resources are integrated into a central repository including educational resources, a service directory of local resources, approved facilities and services, and decision aids.[^] ● In collaboration with consumers, develop evidence-based consumer resources available for different settings (e.g. for community centres, gyms, general practices) in multiple languages, different modes and delivered via a range of options such as hard copy information, telephone support, web-based and social media-based where these resources do not currently exist.^{#^} ● Disseminate to consumers minimum standards for osteoarthritis care for use in Australia (e.g. adapt current European standards and current Australian standards as required). ● Deliver education and support for self-management in primary care, for example, by increasing the capacity of practice nurses and shared medical appointments and by encouraging referral to self-management education classes run by arthritis organisations.
Strategy 4.2	Improve access to evidence-based exercise, weight loss and other pain management strategies
Objectives <ul style="list-style-type: none"> ● Provide access to evidence-based exercise, pain management and weight loss programs 	Implementation <ul style="list-style-type: none"> ● Engage community-based facilities and develop their capacity to deliver evidence-based exercise, pain management and weight loss programs suitable for people living with osteoarthritis. ● Support private health insurance companies to provide access to evidence-based exercise, pain management and weight loss interventions

<p>to people living with osteoarthritis</p> <ul style="list-style-type: none"> ● Improve access to high-quality, evidence-based programmes subsidised by private health insurance ● Upskill health practitioners 	<p>for their members and access to high-quality, evidence-based programmes that are subsidised by the health funds.[^]</p> <ul style="list-style-type: none"> ● Upskill health practitioners through training in the provision of evidence-based advice and support and strategies for on-referral concerning exercise, pain management and weight loss (refer to Priority Area 1), including those disciplines where these interventions have not typically formed part of their traditional scope of practice.[^] ● Implement innovative funding models to support delivery of group-based exercise and/or weight loss interventions, where clinically appropriate. ● Promote psychological and behavioural approaches to assist populations with high vulnerability to reduce chronic pain and improve adherence to care for the management of osteoarthritis.
Strategy 4.3	Provide access to timely interdisciplinary coordinated team care (remotely delivered or onsite) both in community and hospital settings for those individuals who require this level of care
<p>Objectives</p> <ul style="list-style-type: none"> ● Provide appropriate funding models to support interdisciplinary care ● Provide multidisciplinary outreach services for rural areas 	<p>Implementation</p> <ul style="list-style-type: none"> ● Identify and advocate for appropriate funding models to support interdisciplinary care including:[^] <ul style="list-style-type: none"> ○ Reforms to the Australian MBS Chronic Disease Management and Team Care Arrangement schemes to better support high-value care and improved outcomes. Innovative financing changes may include:[^] <ol style="list-style-type: none"> a. provision of a higher number of services for chronic musculoskeletal conditions, based on levels of disability criteria; b. provision of block funding linked to appropriate components and/or standards of care, rather than funding episodes of care that may not include appropriate components of care; c. scaling funding levels according to clinical profiles (e.g. disability level, comorbidity profiles); and d. provision of funding incentives to reward higher value multidisciplinary non-operative treatment and longer GP consultations. ○ Reform rebate schemes for private health insurance and compensation insurance schemes, such that rebates/payments support components of high-value care (e.g. exercise, weight loss and pain management). This may also include a change from episodic to block funding.[^] ○ Reforms to Medicare and insurance schemes to cover care delivery and interdisciplinary care planning using strategies remotely delivered, such as telehealth, especially for physiotherapy. ● Support the development and implementation of healthcare delivery models that enable person-centred coordinated care, including triage assessments by providers with requisite competencies in OA care. ● Scope and undertake a formative evaluation of community-based 'osteoarthritis or musculoskeletal hubs' that allow for stratified care according to clinical presentation complexity or barriers to care: these

	<p>hubs should allow for stratified care and provide upskilling opportunities for primary care practitioners, provide links to secondary and tertiary care when needed and provide multidisciplinary outreach services for rural areas.</p> <ul style="list-style-type: none"> ● Liaise with Primary Health Networks in supporting the integration of community and hospital health services to ensure timely and appropriate care in the right location. Utilisation of health information systems interoperability and data to drive service improvement.
Strategy 4.4	Advocate for musculoskeletal health to be prominent in health policy and planning[^]
Objectives <ul style="list-style-type: none"> ● Expand the MBS Chronic Disease Management initiative and broader implementation of the Healthier Medicare trial to include musculoskeletal health conditions[^] ● Develop appropriate care pathways to support high-value OA care 	Implementation <ul style="list-style-type: none"> ● Support or inform existing or emerging non-communicable disease management and prevention policies, frameworks and funding agreements at State/Territory and Commonwealth levels to explicitly include a focus on musculoskeletal health.[^] ● Promote the value of the expansion of MBS Chronic Disease Management to both MBS and Private Health Insurance Funds to facilitate the implementation of appropriate funding mechanisms. ● Support Primary Health Networks and Local Health Networks to develop care pathways for osteoarthritis, such as Health Pathways. ● Lever recommendations from the World Health Organization (WHO) Global Strategy and Action Plan on Ageing and Health [39] and Guidelines on Integrated Care for Older People (ICOPE) [40] as an opportunity to develop and implement health policy to support functional ability in older people through optimising mobility and addressing musculoskeletal pain. ● Build on current models like the Osteoarthritis Chronic Care Program in NSW and/or pilot an osteoarthritis outreach program in a specific regional area in partnership with the local health service.
Goal 4.2	Ensure access to, and uptake of, lifestyle and other self-management strategies by people with osteoarthritis is equitable across geographic areas, socioeconomic levels and culturally and linguistically diverse groups
Indicator(s) for monitoring	Percentage of Australians with osteoarthritis undertaking lifestyle and other self-management strategies, analysed by area and sub-population groups
Strategy 4.5	Implement and support remotely-delivered evidence-based osteoarthritis services that embrace a biopsychosocial approach and support self-management
Objectives <ul style="list-style-type: none"> ● Provide access to online care services for pain management, exercise and lifestyle modification 	Implementation <ul style="list-style-type: none"> ● Establish new or promote existing models that enable internet and telephone delivery of exercise programs; health coaching for self-management: weight loss and pain management.[^]

<ul style="list-style-type: none"> ● Use digital communication strategies to improve access to osteoarthritis care 	<ul style="list-style-type: none"> ● Develop and implement a training program for healthcare practitioners to support the use of telehealth and internet-supported service delivery models to provide exercise programs.[^] ● Develop guidelines to describe the core capabilities of healthcare professionals engaged in remotely delivered osteoarthritis care programs.
Strategy 4.6	Implement outreach programs to promote high-value care to people living with osteoarthritis, their caregivers and healthcare professionals in regional and rural areas.
Objectives <ul style="list-style-type: none"> ● Identify geographic areas of high demand for osteoarthritis care ● Promote appropriate pathways of high-value care for people with osteoarthritis ● Support outreach services to under-served areas and build local workforce capacity in underserved areas 	Implementation <ul style="list-style-type: none"> ● Work with State/Territory governments and Primary Health Networks to identify geographic areas of high demand for osteoarthritis care and funding options to support outreach services and local workforce capacity building initiatives. ● Engage Primary Health Networks and build extensive partnerships with regional/rural and remote health services as well as other rural bodies (e.g. the Country Women's Association of Australia) in systematising and promoting pathways of care for people with osteoarthritis, taking into account local contexts and priorities. ● Work with non-government organisations and Aboriginal Medical Services to support outreach services to under-served areas and build local workforce capacity in underserved areas to deliver osteoarthritis care through clinical mentoring and establishment of local communities of practice. ● Utilise community pharmacy to provide nationwide health support in rural and regional areas.
Strategy 4.7	Develop education and osteoarthritis management programs that are appropriate for and relevant to culturally and linguistically diverse groups
Objectives	Implementation
Identify specific needs of culturally and linguistically diverse groups and service gaps	<ul style="list-style-type: none"> ● Develop and test information resources in different languages and work with culturally and linguistically diverse groups to ensure programs meet their needs. ● Increase the indigenous medical specialist and allied health workforce as well as Aboriginal Health Services to improve delivery of non-surgical and surgical care to indigenous populations

5.3 Advanced Care

Priority 5	Optimise decision-making processes leading to total joint replacement surgery and maximise client outcomes following total joint replacement surgery for people with severe osteoarthritis
Goal 5.1	Optimise the shared decision-making process for joint replacement for both healthcare practitioners and people with severe osteoarthritis
Indicator(s) for monitoring	The appropriateness of surgeries performed after using the decision tool.
Strategy 5.1	Have structured patient decision-aids and education materials available for everyone considering total joint replacement
Objectives <ul style="list-style-type: none"> Develop an optimal decision aid tool Develop portals, websites and hard copy of the education materials designed for people with osteoarthritis to enhance their understanding of the value of non-surgical management and the outcomes from surgery Deliver tailored information and structured decision-aids and education materials to consumers 	Implementation <ul style="list-style-type: none"> Collate the existing patient decision aids and educational materials available for people considering a joint replacement via a mapping exercise and systematic search in Australia. Develop an optimal shared decision making aid via a Delphi exercise or expert task force, including consumers, to ensure it is appropriate, feasible and applicable for the Australian population and healthcare system. Communicate with surgeons, relevant colleges and consumers to develop national decision aid tools which incorporate patients' individual preferences and involve surgeons to be the advocate for the tools to standardise care. Utilise existing resources (e.g. college guideline for osteoarthritis management) and research (e.g. Centre of Research Excellence) to facilitate the delivery of structured patient decision-aids and education materials. Develop programs similar to GoShare Healthcare that allow the delivery of tailored information to consumers.
Strategy 5.2	Ensure available decision aids are embedded in current practice
Objectives <ul style="list-style-type: none"> Promote decision aids through multiple media Incorporate standardised decision aids into the existing healthcare systems 	Implementation <ul style="list-style-type: none"> Ensure decision aids are available through multiple media (e.g., online module, flyer, telehealth, mobile application etc.) to meet the individual preference of health professionals and patient. Incorporate a referral pathway to link with existing and planned osteoarthritis education and non-surgical care programs (e.g. Osteoarthritis Hip and Knee Service, Osteoarthritis Chronic Care Program [41], Comprehensive Osteoarthritis Pathway TAS).
Strategy 5.3	Embed patient information in decision aids to promote a shared decision-making process between patients and surgeons
Objectives	Implementation

<ul style="list-style-type: none"> ● Adopt a national and state-wide application to capture patients' decisions and key health outcomes 	<ul style="list-style-type: none"> ● Support innovative information and communication technology-enabled strategies (e.g. eHealth, joint replacement registry, data linkage) to make assessments of the needs for joint replacement . ● Integrate the decision aids with population registries (e.g. Australian Orthopaedic Association National Joint Replacement Registry) to collect patient-centred outcome data and clinical performance of healthcare (e.g. willingness for surgery) over a specified period of time (e.g. audit and feedback systems). ● Provide a directory of existing physical activity, weight-loss, and other specialist services in the decision aid (e.g. National Health Service Directory, e.g. Health Pathways). ● Involve the Primary Health Networks and allied health associations.
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Priority 6	
Implement non-surgical management of severe osteoarthritis in the community	
Goal 6.1	Promote the dissemination of information on evidence-based non-surgical management for people with severe osteoarthritis to the public, primary healthcare practitioners and specialist orthopaedic practitioners
Indicator(s) for monitoring	Proportion of patients who are appropriately identified as not suitable for joint replacement
Strategy 6.1	Increase access to resources and awareness of evidence-based non-surgical management prior to considering surgery
Objectives <ul style="list-style-type: none"> ● Promote local clinical guidelines, pathways, care standards and model of care ● Promote existing programs tailored for osteoarthritis management ● Support surgeons to manage consumer expectations and preferences 	Implementation <ul style="list-style-type: none"> ● Promote existing programs such as Osteoarthritis Chronic Care Program [41], Healthy Weight For Life, Good Life with osteoArthritis in Denmark (GLA:D). ● Increase public awareness of evidence-based non-surgical management for people with severe osteoarthritis by engaging with mass media and other effective marketing strategies (e.g. advertisement/infographic at clinic waiting room etc.), co-designed with consumers emphasising the implications of surgical intervention. ● Partner with community and not-for-profit organisations to promote appropriate non-surgical care for people with osteoarthritis as a precursor to surgery. ● Develop and provide ongoing inter-professional education for healthcare professionals on evidence-based non-surgical management for people with severe osteoarthritis. ● Establish partnerships with the relevant organisations and utilise existing resources such as chronic disease management, mental healthcare plan, pain management programs, physiotherapy services. ● Provide access to accreditation/continuing professional development/qualification for healthcare providers and utilise co-education (supplement diabetes education) to increase the economic viability of service delivery.

Goal 6.2	Enhance access to, and uptake of, effective non-surgical management for people with severe osteoarthritis
Indicator(s) for monitoring	Uptake of effective non-surgical management by people with severe osteoarthritis
Strategy 6.2	Advocate for funding models (public and private) to support packages of care inclusive of exercise, weight loss, pain management and psychological health interventions, that align with people's needs, preferences and places of residence[^]
Objectives <ul style="list-style-type: none"> • Ensure non-surgical management is promoted by institutional healthcare providers (e.g. Local Health Districts) • New MBS items for allied health • Include allied health practitioners in public and private settings • Offer pain management strategies as a priority strategy and promote self-management to consumers 	Implementation <ul style="list-style-type: none"> • List New MBS items (linked to accreditation) for allied health (e.g. longer consultations where needed; reimbursement of nursing and allied healthcare at a level adequate to achieve agreed outcomes; reimbursement for communication between practitioners; reimbursement of evidence-based complementary interventions by accredited practitioners). • Advocate for funding for programs at community-based clinics. • Expand funding for novel models of services (e.g. telehealth) provision, evaluation and training to include allied health practitioners in public and private settings (e.g. revision of Medicare item numbers for allied health services to accommodate telehealth consultations).[^] • Offer pain management strategies as a priority strategy to consumers and use consumer health organisations (e.g. Consumers Health Forum of Australia in each state and the national Forum in ACT) to promote messages of self-management to consumers; work with state arthritis offices and surgeons to drive the initiatives and with consumer bodies to assist in managing consumer expectations. • Provide financial incentives to reward conservative treatment.
Strategy 6.3	Implement outpatient service models for non-surgical management of severe osteoarthritis
Objectives <ul style="list-style-type: none"> • Reduce the unnecessary referrals to hospital care • Educate consumers on healthy behavioural changes 	Implementation <ul style="list-style-type: none"> • Increase access to the MBS Team Care Arrangement scheme to reduce the unnecessary referrals to hospital care. • Accredite osteoarthritis management educators, who are upskilled in both physical and psychological domains (i.e. not a new discipline, but an accredited role that could be performed by any health professional with training, knowledge and skills). • Educate consumers on healthy behavioural changes, motivational strategies. • Involve a wide variety of allied health in the delivery of the initiative. • Tie into the current funding arrangement within community pharmacy.

Priority 7 Improve access, efficiency and cost effectiveness of services across healthcare systems for managing people with severe osteoarthritis	
Goal 7.1	Promote an efficient clinical pathway from diagnosis of severe osteoarthritis (in appropriate people for total joint replacement) to the execution of surgery
Indicator(s) for monitoring	<ul style="list-style-type: none"> • Waiting time for people who are appropriately selected suitable for total joint replacement (a Category 2 classification would be expected[^]) • Length of hospital stays
Strategy 7.1	Ensure that total joint replacement surgery is provided, to those who need it, within timeframes consistent with current Australian policy on urgency categorisation [^]
Objectives <ul style="list-style-type: none"> • Implement a consistent, national and state-wide post-operative pathway of care, with an emphasis on discharge to the home environment where access to appropriate post-operative care services, such as allied healthcare, is available[^] • Funding models reform for both private and public programs • Development of standardised pathways in patient portals 	Implementation <ul style="list-style-type: none"> • Expand tertiary-based osteoarthritis services to community-based settings with appropriate operational modifications to suit the local context. Any expansion of the current services into community settings should be coupled with local stakeholder consultation to ensure the model of service delivery meets the local operational requirements.[^] • Consult with, and support, Primary Health Networks to develop strategies and pathways for community-based service delivery for people with osteoarthritis. • Identifying appropriate patient flow in rural settings as a priority.[^] • Ensure personnel in appointed facilities or local musculoskeletal clinic coordination roles (e.g. through Osteoarthritis Hip and Knee Service sites, community musculoskeletal centres) have the opportunity to meet biannually for peer support and service standardisation.[^] • Develop national guidelines for joint replacement which incorporate best practice for conservative management. • Replicate some state-wide models and involve primary care to help triage and provide the care when hospitals aren't funded to provide such care.
Goal 7.2	Prioritise access to non-surgical management programs for people on the joint replacement waiting list
Indicator(s) for monitoring	Proportion of people on joint replacement waiting lists who have been given access to non-surgical management programs
Strategy 7.2	Ensure evidence-based non-surgical management has been accessed or completed by people with osteoarthritis before being placed on joint replacement waiting lists
Objectives <ul style="list-style-type: none"> • Establish public and private advanced practice physiotherapy roles in community centres, initially for surgical triage and 	Implementation <ul style="list-style-type: none"> • Perform multidisciplinary pre-surgery assessments to identify possible surgical risk factors and inform discharge planning: <ul style="list-style-type: none"> ○ group meetings to discuss management and agree on management plan; ○ facilitate co-location of practitioners where possible. • Establish private and public musculoskeletal health centres, incorporating allied health, medical and orthopaedic surgery practitioners, to provide

post-replacement review [^]	<p>services for people with advanced osteoarthritis or complex presentations, particularly for complex persistent pain. Where feasible, these centres would link with subacute care funding initiatives.[^]</p> <ul style="list-style-type: none"> ● Monitor patients' status while on a surgical wait list using an appropriate, simple tool to identify patients who are deteriorating rapidly and should be fast-tracked for surgery.[^]
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5.4 Validation of Implementation plans

The Implementation Committee has reviewed the proposed implementation plans and been very supportive of the importance, practicality and feasibility of the plans. Many of the strategies are seen as having a high priority and readily implementable at a national level:

- 20 strategies (80%) were rated as 'high priority';
- At least 75% of the survey respondents from the Implementation Committee agreed that 23 strategies are likely to be implementable at a national level;
- Two strategies are deemed to be achieved in short-term (until 2020), 17 in medium-term (until 2023), and seven in long-term (until 202) (see Section 4).

The committee also highlighted the enablers, barriers and horizon opportunities of the implementation plans (see Appendix B). The committee will also make recommendations from a financial perspective with economic modelling and evaluation, considering the high cost of current osteoarthritis management and desired outcomes of implementing the National Osteoarthritis Strategy.

5.5 Stakeholder Analysis

The implementation of the Strategy will require collaborative and collective efforts from a wide range of stakeholders across all health system sectors and beyond, including all levels of government, Primary Health Networks, private sector partners, industry, health professionals, professional bodies, not-for-profit organisations, consumer groups, non-government organisations (including general, non-health insurers), community service providers and the education system.

Engaging stakeholders through whole society and government approaches must be adopted in order to synergise and integrate osteoarthritis prevention and management at all stages of one's life course. Such engagement will continue over the course of the implementation process to ultimately ensure best practice osteoarthritis management is accessible to all Australians.

The stakeholders are identified based on Whole of Government and Whole of Society approaches, as the development and implementation of the Strategy depend on the economic, physical, social and environmental factors and require joint planning from all sectors to implement significant changes in the environment we live and socio-cultural shifts. Table 2 below provides a snapshot on the type of stakeholders that could be involved in the response to osteoarthritis, with a list of the stakeholder groups that have been involved in the development of the Strategy thus far provided in Appendix F.

Table 2 Stakeholders Analysis

Government	Non-government
Ministry of Health Primary Health Networks Public hospitals State and local governments	Health-related NGOs/Community Groups Arthritis Australia & State Arthritis offices. Public health and chronic disease associations Peer support groups
Non-health Ministries/Government Agencies Department of Agriculture and Water Resources Australian Sports Commission Department of Education Department of Finance Community development Department of the Environment Department of Foreign Affairs and Trade Department of Infrastructure, Regional Development and Cities Department of transport	Non-health NGOs Sporting associations Youth and sports organisations
	Private sector Insurance companies Food and beverage companies Health and wellness centres Private hospitals Local businesses and organisations
	Workplace & Schools (private and public)
	Media
	Professional peak bodies
	Professional colleges/Accreditation organisations
	Healthcare providers (e.g. GP, specialists, Allied Health professionals, orthopaedic surgeons, pharmacists)
	Academia
	Rural Health Agencies
	Consumers

6 Evidence-based Strategic Priorities

In developing strategic responses to optimise outcomes for people at risk of, or with, osteoarthritis, three working groups reviewed the literature to date and identified a number of achievable strategic priorities, based on a set of prioritisation criteria. The summary of the evidence supporting the identified priority areas are outlined in this section, which directs the objectives and strategies to address the problem areas. The detailed evidence is elaborated in Appendix A.

6.1 Evidence for Prevention

- Lack of implementation of prevention and management programs to address the multifactorial nature of obesity and physical activity for osteoarthritis prevention
- Joint injuries are one of the leading causes of the development of osteoarthritis, especially at an early age
- Injuries in sport are a barrier to adopting an active lifestyle
- Joint injuries in sport can be controlled through exercise-based training programs
- Exercise-based programs are effective but hard to implement at a broad level

6.2 Evidence for Living Well with Osteoarthritis

- Under-utilisation of lifestyle interventions by Australian primary care practitioners
- Over-reliance on medications by people diagnosed with osteoarthritis
- Lack of equitable uptake of evidence-based and affordable, tailored, non-surgical care and support for ongoing self-management

- Economic analysis of alternative funding models for osteoarthritis care, for example, block or outcome funded, rather than funded based on occasions of service
- Evaluation of a community ‘Osteoarthritis Hub’ model, commencing with what is available now, what has worked, what has not (process evaluation)
- Evaluation of the effectiveness of existing treatments where there is little evidence available (e.g. platelet-rich plasma and stem cells) and the development and evaluation of new treatments, to expand the range of evidence-based treatment options available to people with osteoarthritis
- Investigation of strategies to maximise patient adherence to lifestyle management including exercise and weight loss
- Provision of evidence for treatments commonly used for osteoarthritis management where evidence gaps exist, including treatment of osteoarthritis at under-researched joints such as the hand and foot
- Examining service delivery models and outcomes for vulnerable groups such as residents of residential aged care facilities, where low-value care is prioritised and funded; Aboriginal and Torres Strait Islander peoples who have poorer outcomes and access to care; and injured workers who access care through compensable schemes

7.3 Research Agenda for Advanced Care

The following three areas have been identified as the research priorities in advanced care of osteoarthritis:

- Development of a validated patient selection tool that can predict better outcomes for total joint replacement
- Development of more effective (pre-operative) non-surgical interventions for people with severe osteoarthritis
- Examination and identification of barriers to uptake of non-surgical interventions for people with severe osteoarthritis

7.4 Osteoarthritis National Data Strategy

“No data, no disease!”

In addition to the research agendas outlined by each theme, the project team also identified utilising data and evidence to drive quality improvement in osteoarthritis management as an overarching data strategy spanning across all three thematic areas. Good quality and accurate data are needed to (1) identify the burden as prevalence and impact; (2) to measure uptake of evidence and guidelines; and (3) to monitor change in the health condition over time. For example, enhancing health information systems interoperability and data will help to drive service improvement. Expanding and enhancing existing registries and/or creating population-based datasets by linking bio-specimen, patient clinical data and outcomes will provide useful information to support benchmarking and quality improvement in the prevention, management, treatment and outcomes of osteoarthritis.

“The more we share, the more we have.”

Currently, activities in data collection and management for osteoarthritis are fragmented and would likely benefit from greater coordination and increased collaboration between different systems through data linkage. Potential solutions as part of data strategy include:

- Adequate support for the National Arthritis Monitoring Centre to collate, analyse and distribute currently collected osteoarthritis and other MSK data from state and national data collections;
- Support to enhance current data collection strategies by including patient-reported outcomes supported in national collections such as the Joint Registry; and by enabling data linkage capabilities with PBS, MBS and other data sources for costing and outcomes analytics;
- Support for a national arthritis strategic Data Group.

8 Appendix

A. Detailed Evidence-based Strategic Priorities

Prevention

Osteoarthritis affects the whole joint and is moderated by both biomechanical (joint loading), metabolic (inflammatory) and psychosocial factors [42-44]. Public health strategies that aim to prevent osteoarthritis should target those modifiable risk factors through the development of multifaceted and feasible interventions [45-47].

Evidence related to both primary and secondary osteoarthritis prevention is presented in this section. For primary prevention, we consider strategies that prevent overweight, obesity and joint injury, while secondary prevention strategies aim at preventing the progression of the disease in individuals that are “at risk” (overweight, obese or have a prior joint injury) [46, 47].

Priority 1 Implement multifaceted programs to prevent obesity and increase physical activity for the prevention of osteoarthritis

The link between obesity, overweight, joint injury and osteoarthritis is well established in the literature [15, 47-51]. Despite the substantial interest in the primary prevention of obesity, no country to date has reversed its obesity pandemic [52]. There are clear statements of what is required across government, non-government, community and industry. However, many countries, including Australia, are slow to take action [53, 54].

Prevention of obesity is both challenging and problematic due to a range of factors, including the complexity of the determinants of obesity, along with a lack of resources and/or reluctance of governments to commit to a sustained multi-level approach that also addresses unhelpful commercial interests [55]. The global obesity pandemic is primarily attributed to an energy imbalance commonly characterised by energy-dense, poor quality dietary patterns and reduced levels of physical activity, however, an interplay between multiple factors makes prevention (and management) much more complex [56, 57].

Recent systematic reviews [58-61] highlight the outcomes of obesity prevention programs to date, but the effectiveness of interventions is more pronounced for programs targeted to children [62] and for multi-factorial interventions that seek to improve diet and physical activity [60]. The ‘one size fits all’ approach has been shown to be ineffective, while strategies that combine population-level policy with a specific group or setting-based interventions and programs were typically more successful [61, 63].

An assessment of the cost-effectiveness of a number of obesity prevention approaches conducted in Australia found that policy and regulatory approaches were generally more cost-effective than health promotion or clinical interventions [64]. Although the wide ranging impact of the obesity problem in Australia is recognised [65-67], current government programs and initiatives specifically designed to tackle the issue are hard to identify. To date, responsibility for obesity prevention has been largely left to individuals and non-government initiatives [68] with various stakeholder groups engaged. Strategies and priority areas to consider the complex and multifactorial nature of obesity across the lifespan from the existing literature include the following [69, 70]:

- Advocating for the recognition of obesity as a chronic disease,
- Developing a clinical toolbox to assist health professionals in preventing obesity,
- Developing equitable prevention strategies across the lifespan, including pre and primary school children,

- Implementing regulatory mechanisms to reduce the consumption of unhealthy foods,
- Developing a national active transport strategy,
- Creating public education campaigns to improve attitudes and behaviours around diet, physical activity and sedentary behaviour,
- Establishing obesity as a national priority with a national taskforce and,
- Developing support for the update and monitoring of national guidelines for diet, physical activity and weight management.

Another issue affecting the translation of evidence-based obesity prevention interventions is the lack of external validity and process evaluation reports regarding the majority of clinical trials related to the prevention of weight gain and maintenance of weight loss [59, 62, 71]. To bridge the 'gap' of evidence to practice in the prevention of obesity and the promotion of healthy lifestyles, researchers and service providers need to increase their own knowledge, understanding and skills and also develop partnerships with experts in business, marketing, policy change, and advocacy [72].

In summary, the complexity of the prevention of obesity is illustrated by the multifactorial nature and causes of the problem. To achieve an improvement in such a complex issue requires implementing strategies that address the multiple stakeholders involved, identifying their perceptions and beliefs, learning from their experiences and considering the local context of the systems in which they interact [63, 73, 74]. There is a need to address the lack of a comprehensive, integrated and multi-sectoral approach to obesity prevention and management across Australia.

Priority 2 Adhere to joint injury prevention programs

Joint injuries in sport lead to osteoarthritis

Joint injuries are one of the leading causes of the development of osteoarthritis in young adults [75]. Evidence shows that 12% of the overall prevalence of symptomatic osteoarthritis is related to post-traumatic osteoarthritis of the knee, hip and ankle [76]. Most commonly, the association between injuries to the anterior cruciate ligament (ACL) of the knee and the development of knee osteoarthritis within 5 to 15 years after initial injury regardless of how the injury is managed is well known [77, 78]. Australia has the highest incidence of ACL reconstructions in the world, causing a financial burden on the healthcare system [79].

Injuries in sport are a barrier to adopting an active lifestyle

To identify and address the injury and safety-related barriers that prevent people from leading a more active lifestyle, the Victorian Government established a Sports Injury Prevention Task Force [80]. In their 2013 report, four focus areas of intervention to drive participation, performance and sports injury prevention were established: (1) Increase awareness of the benefits of sports injury prevention and management for participation and performance; (2) Enhance the safe participation of children and adolescents; (3) Address injury in the high participation (team) sports; and (4) Improve the sports medical emergency response and injury prevention planning and practice. A series of strategies was also proposed to enable those interventions, such as building awareness and increasing acceptance of the positive impact of injury prevention on performance and participation. Ideally, this requires a systemic approach to implementing injury prevention utilising drivers (coaches, support of policies, practices and rewards) to influence a positive culture around sports injury prevention.

Joint injuries in sport can be controlled through exercise-based training programs

There is a growing body of literature to demonstrate the efficacy of multifactorial injury prevention programs in sports that focus on exercises for stability, balance, weight, plyometric, agility, and sports-specific

movements [81-91]. Despite the demonstration of program efficacy in controlled settings, the development and implementation of these types of injury prevention programs in Australia have been limited [1]. This is for several reasons, described in the sections below. However, because of the growing body of evidence internationally supporting the benefits of these programs, Arthritis Australia, Sports Medicine Australia and the Australian Orthopaedic Association have all advocated a proposal developed by the Global Alliance for Musculoskeletal Health of the Bone and Joint Decade to implement a population-level injury prevention program in Australia. The proposal is based on incorporating injury prevention content into existing coach education resources and programs; research into sport-specific content; and intervention at the community sports level through a coach-directed, 'train the trainer' approach [1].

Exercise-based programs for injury prevention in Australia

The Preventing Australian Football Injuries through eXercise (PAFIX), funded through the National Health and Medical Research Council, was one of the earliest exercise-based programs to be developed and tested. Using a cluster randomised controlled design, the effectiveness of a specially developed program on injury rates was evaluated. Community-level Australian football players who were in the intervention arm of the program had a 22% reduction in lower limb injury rates and a 50% reduction in knee injury rates, compared to the control arm of the program. The reduction in the injury incidence rate was considered to be a clinically important outcome because of the large impact these injuries have on players' health and participation, although it was not a statistically significant finding [92]. Since the PAFIX trial, several international programs have been developed and evaluated, the most well-known of these being the FIFA 11+ [93] targeting young football players.

Exercise-based programs are effective but hard to implement at a broad level

It is recognised that there is a gap between research and practice in the field of sports injury prevention [94]. Successful outcomes of injury prevention programs depend on effective interventions being implemented to ensure adherence to, and maintenance of, the program as designed, i.e. a player can turn-up and do the training but that does not ensure the correct training is actually performed [95]. There are several reasons why the implementation of these programs is a challenge, including, among others:

- **Reach:** A secondary analysis of the PAFIX trial showed that more than half of the players (55%) attended only one instead of the two weekly sessions intended. [96]. High compliance to an injury prevention program is important as this has been shown to be related to significantly lower risk for all injuries (35%) and gives significant improvements in functional balance in a soccer-based program, the FIFA 11+ [97].
- **Coaches' beliefs:** Another Australian football study found that coaches' beliefs and specific practices were affecting the implementation of evidence-based exercises for lower limb prevention [98].
- **Few studies report implementation:** A systematic review to evaluate the benefits of lower limb injury prevention exercise protocols for the Australian Football League, showed the lack of reporting of implementation issues, such as intervention adherence or behaviour change related to the adoption of the intervention, for the majority of the studies included. The reasons for the lack of adherence and the context in which the interventions were implemented, were also not routinely explored [99].

Proven efficacy does not guarantee success in preventing injuries in the real world, and more focus should be given to the process needed to translate those interventions into effective and sustainable prevention programs [100-102]. An analysis of 12,000 manuscripts in sports injury prevention published in 2010, showed that about only 4% of the papers assessed the effectiveness of sports injury prevention interventions and their implementation [103]. Some of the concepts required for successful implementation have already appeared in the sports injury prevention implementation literature, such as understanding the implementation context; adopting a multilevel or ecological approach to implementation activities; and engaging intervention end-users in the planning and operationalising of implementation activities [104].

Added to that, it is also important to consider the development of implementation and evaluation strategies to address key barriers and facilitators; and to adopt a cross-disciplinary mixed research approach that considers both hard and social science [105].

Given the ever-growing issue with poor knowledge to action in the injury prevention field as described above, it is now important to develop an implementation “plan of action” and practical tools. This can assist in identifying the factors when implementing injury prevention programmes to be more widely used by the community and have an impact at the population level [106-108].

Living Well with Osteoarthritis

Safe, effective, non-surgical, non-pharmacological interventions for the management of osteoarthritis are available [109]. Several osteoarthritis management guidelines have been produced to summarise the scientific evidence available for osteoarthritis treatments, and to inform the practice of health practitioners [5, 110-113]. There is a relative consensus among these guidelines that the core components of osteoarthritis management should be tailored to suit the individual and include non-surgical, non-drug treatments; i) support for effective osteoarthritis self-management, ii) exercise and iii) weight loss [109, 114]. However, there is evidence that currently, not all Australians have access to this high-value osteoarthritis care [115]. The Strategy aims to empower Australians with osteoarthritis not just to live with their condition, but to live well with their osteoarthritis. This will only be achieved through improving access to high-value care for all Australians with osteoarthritis.

Priority 3 Support primary care practitioners to deliver high-value care to people with osteoarthritis, including increased prescription of lifestyle interventions

There are a number of barriers to the implementation of consistent, evidence-based osteoarthritis care in Australia. To date, the policy and system responses to osteoarthritis have not been commensurate with the burden of disease [31]. However, over the last decade, substantial improvements in policy and system-level capacity have been observed, particularly with the introduction of Models of Care for osteoarthritis in NSW, VIC and WA [116].

The CareTrack study in Australia reported that of 3517 primary care-based healthcare encounters in 2009–10, only 43% (95% CI 35.8–50.5%) provided appropriate care for patients with osteoarthritis [31]. This is a reflection of practice internationally; a systematic review and meta-analysis of quality care indicators found that only 36.1% (95% CI 27.8–44.7%) of patients with osteoarthritis received adequate quality of non-drug osteoarthritis care; the authors identified that this was particularly concerning given that exercise and physical activity are effective management strategies [117]. Another systematic review and meta-analysis reported similar results: only 38.7% (28.9–49.5%) of patients were referred for or received a recommendation to exercise and 35.4% (95% CI 27.8–44.0%) were offered education and self-management [118].

There appears to be a disconnection between recommendations from evidence-based osteoarthritis management guidelines for healthcare practitioners and the adoption of these into clinical practice. A survey of Australian GPs reported favourable attitudes towards clinical practice guidelines as aids to support decision-making in practice. However, the familiarity and actual use of the Royal Australian College of General Practitioners Osteoarthritis Guideline by GPs was poor [119]. A recent systematic review synthesised studies that identified the barriers and enablers to the management of osteoarthritis as reported by primary care practitioners. There were no themes identified that were enablers. Emergent themes that were barriers included; “1) Osteoarthritis is not that serious, 2) Healthcare practitioners are, or perceive they are, under-

prepared, 3) Personal beliefs at odds with providing recommended practice, and 4) Dissonant patient expectations” [120], specifically whether an exercise program will stop the pain of osteoarthritis or improve function despite the pain. These barriers should be considered when addressing evidence-practice gaps.

Underutilisation of lifestyle interventions

A recent large study found that although the attitudes of UK GPs towards prescribing or recommending exercise for osteoarthritis are generally positive, documented barriers to the initiation of exercise programs include insufficient time during consultations and lack of expertise [121]. This is likely to be the case for Australian GPs. One way to address this is to refer patients with osteoarthritis to practitioners skilled in exercise prescription and behaviour change. However, it is well-documented that the health service use of people living with osteoarthritis in Australia is often limited to consultation with GPs and the subsequent referral rate by GPs to appropriate allied health services is low [122].

A survey of Australian GPs found that non-drug treatments such as exercise continue to be underutilised despite the strong recommendations for use of these modalities in the Royal Australian College of General Practitioners Guideline for the non-surgical management of hip and knee osteoarthritis [115]. Further, the Bettering the Evaluation and Care of Health (BEACH) study found that only 17 of every 100 GP contacts with patients with hip and knee osteoarthritis utilised lifestyle management interventions (e.g. referral to a dietitian or physiotherapist, advice/education/ counselling, or physical medicine/rehabilitation) [123]. A subsequent analysis of BEACH data reported similar findings for the management of foot/ankle osteoarthritis by GPs [124]. Most patients with foot/ankle osteoarthritis were managed using medication (64.6 per 100 problems) with a relatively low rate of people managed with non-pharmacological strategies such as counselling, advice or education (17.7 per 100), or referral to allied health practitioners (10.1 per 100) [124].

In Australia, one of the barriers to referring patients for lifestyle interventions is that current funding models do not adequately support delivery of allied health and services. The Medicare Benefits Schedule (MBS) provides funding for face-to-face consultations with GPs and medical specialists. However, the MBS provides only very limited funding support for patients who need allied health support for osteoarthritis. Currently, the Medicare rebate is available for a maximum of five services per patient each calendar year. There are several key requirements to enable patients to access this rebate: i) Patients must have a GP Management Plan and Team Care Arrangements prepared by their GP; ii) referrals to allied health practitioners must be from GPs; and iii) allied health practitioners must report back to the referring GP [125]. This current arrangement can be burdensome to set up for treating GPs and can provide a barrier to access the rebate for patients

GPs are not the only healthcare practitioners under-utilising appropriate lifestyle interventions for osteoarthritis patients. A recent survey in Australia and New Zealand revealed that almost a third of physiotherapists did not always prescribe exercises during their consultation with people presenting with knee osteoarthritis [126]. This is particularly concerning when compared with evidence that 99% of physiotherapists are using exercise for knee osteoarthritis in the UK [127].

Over-reliance on medications

While lifestyle interventions such as weight loss and exercise are underutilised, Australian GPs consistently prescribe pharmacological treatments for their patients with osteoarthritis [115, 128]. There are several concerns with this approach:

- There appears to be an over-reliance of healthcare practitioners on the use of medications in the absence of lifestyle interventions [115, 123].
- It appears that GPs continue to prescribe/recommend medications for osteoarthritis that either demonstrate very little beneficial effects (such as paracetamol [123, 129]) and/or carry unacceptable risks of side effects. Opioids are potentially addictive, and may cause constipation, nausea, vomiting,

hyperalgesia, confusion, drowsiness and respiratory depression; and non-steroidal anti-inflammatory drugs (NSAIDs) carry well-known gastrointestinal and cardiovascular risks. [115, 123].

Therefore, people living with osteoarthritis continue to rely on medications for management of their osteoarthritis as a primary treatment modality, but which may not be as helpful to them as lifestyle interventions (such as exercise and weight loss). Further, many people living with osteoarthritis have comorbid conditions such as diabetes and heart disease that would also derive benefits from lifestyle interventions.

Priority 4 Improve the uptake of evidence-based and affordable, tailored, non-surgical care and support for ongoing self-management by all Australians with osteoarthritis

Some Australians living with arthritis report poorer access to GPs, specialists, allied health and rehabilitation, reduced access to quality information about treatment options, and generally feel dissatisfied with the care from their healthcare practitioners [130]. This is particularly relevant for people who live in rural/remote areas [131], where services are often limited or non-existent [132]. This is consistent with a systematic review of evidence from the international literature [133]. The problem is further compounded in regional and remote populations, where there are higher rates of arthritis compared to those in major cities; with more than two in three people being overweight or obese; and almost three in four people not undertaking enough exercise [134]. Evidence confirms that a wide divergence between evidence-based recommended care and practice exists for people living with osteoarthritis [117]. It appears that access to osteoarthritis care is especially poor for Indigenous Australians [135-137]. This is particularly worrying given evidence that self-reported arthritis is more prevalent in Indigenous compared with non-Indigenous Australians [138].

A recent study asked people living with osteoarthritis to recall their experiences accessing osteoarthritis care in Australia. A recurring theme was that people were advised to 'put up with' their condition and were offered few options for their treatment. Long waiting times and difficulty obtaining outpatient appointments within the public hospital system were identified as barriers to accessing treatment. Lack of access to health professionals was a larger problem for people living in regional areas of Australia. Financial factors that were barriers to accessing treatment included difficulty taking time off from work to attend appointments and the cost of appointments with little rebate from private health insurance [139].

In addition, the access to care can be limited by geographical isolation and patients' inability to pay. Data exist showing Australian patients are willing to embrace novel, remote tele-rehabilitation models for their osteoarthritis care [140] but there are barriers to implementing these. Barriers associated with models of service delivery include: lack of access to services, lack of funding for allied health tele-rehabilitation consultations (both MBS and private health insurance), healthcare practitioner reluctance to change their traditional models of face-to-face care, and the continually changing infrastructure and training to implement these treatment models [141].

Around 60% of Australians demonstrate low health literacy [142]. Low health literacy is strongly associated with poorer health outcomes, and is the main driver behind making adult health literacy a research priority area of the Australian Commission on Safety and Quality in Healthcare. In general, there is also poor quality of information available to people regarding symptom management strategies for their osteoarthritis [33, 130, 139]. When formal group-based osteoarthritis self-management education programs are offered, the uptake of these programs can be poor and effectiveness limited [143]. Barriers to participation in osteoarthritis self-management programs may include physical limitations, difficulty travelling to a venue, work commitments and disinterest (demonstrated by patients and sometimes their health professionals) [144]. This is an

important area for future research; osteoarthritis self-management education should be made more accessible by integrating these interventions into different models of healthcare delivery [108, 144].

There is a lack of uptake and adherence (in both the long and short-term) to exercise and weight loss interventions by people living with osteoarthritis in Australia. A survey that asked 591 Australians with hip and knee osteoarthritis about self-management strategies found that only a small proportion of people were engaged in highly recommended self-management strategies. Only 50% of respondents were trying to lose weight, 18% were engaged in a muscle strengthening program, 6% were participating in fitness classes and 7% in hydrotherapy [145].

There is also systematic review evidence that practitioners such as musculoskeletal physiotherapists recognise that psychological interventions are valuable to achieve behaviour change and support patients to self-manage their condition. However, physiotherapists believe that they are inadequately trained to effectively utilise the psychological interventions that may be helpful to patients [146]. This evidence was further supported by a recent Australian study that reported while physiotherapists recognised the importance of person-centred care (which is focussed on the empowerment of patients to self-manage their osteoarthritis), their current knowledge and clinical practice in this area was limited [147].

Advanced Care

A cost-effective intervention to treat severe osteoarthritis of the hip or knee is primary joint replacement, or surgery to remove painful, damaged joint surfaces and replace them with artificial weight-bearing surfaces [148]. Greater numbers of people over the age of 60, increased rates of obesity and joint injury, sedentary lifestyles and greater expectations of quality of life are all driving the increasing demand for joint replacement both internationally and nationally [149-151].

In 2016, almost 115,000 Australians underwent hip, knee or shoulder replacement [152], with approximately 37% of all joint replacement surgeries performed in public hospitals [152]. Over recent years, variations in the provision of care and rising healthcare costs have contributed to the need to ensure that the provision of healthcare is effective, efficient and safe. Increasing demand for joint replacement or other surgery will require effective and efficient strategies for the application of limited resources to provide equitable and appropriate provision of care as part of the Australian system of universal healthcare. Selecting the right candidates for total joint replacement surgery is essential, but not well studied. Three prioritised reform areas relating to joint replacement care have been identified by the working group.

Priority 5 Optimise decision-making processes leading to total joint replacement surgery and maximise client outcomes following total joint replacement surgery for people with severe osteoarthritis

Limitations of existing patient selection and prioritisation criteria

Total joint replacement surgery represents major orthopaedic surgery. It should only be undertaken based on valid prognostic factors and when all other appropriate non-operative management strategies have been tried. Currently, up to one-quarter of total joint replacements are performed on inappropriate candidates according to evidence-based criteria [153]. A substantial proportion of patients are unsatisfied or continue to experience persistent pain after total hip replacement (6–27%) and total knee replacement (15-44%) [154], indicating that outcomes are less than expected and/or that expectations were too high [155]. Meeting pre-operative expectations and achieving satisfactory pain relief appear to be the most important factors in predicting the success of total joint replacement and identification of those patients who respond well to

surgery ('responders') may assist in delivering the most cost-effective management [156]. It would seem reasonable that healthcare practitioners and hospital management adopt criteria for both selecting candidates and for assessing appropriateness for surgery. Yet there are currently very few formal predictive tools available to aid referring healthcare practitioners determine those likely to be good or poor responders to surgery.

Appropriateness criteria

It seems evident that pain, function, radiological changes and failed conservative therapy should be part of future studies on joint replacement indications. However, pain and function are relatively subjective measures, both when reported by the patient and when judged by the health practitioner. This is illustrated by the fact that although consensus on the indication domains seems to exist, symptom severity greatly varies at the time of surgery across different centres in Europe and Australia [157]. Despite the availability of validated questionnaires to assess pain and disability in osteoarthritis patients [158-160], it does not appear that these patient-reported measures are being used systematically by orthopaedic surgeons [161]. Similarly, patients agreed that pain was currently inadequately evaluated by surgeons [162]. Accordingly, there is a need to focus on instruments that measure pain and function in a way that is meaningful for both surgeons and patients, and delivered in the context of making decisions regarding appropriateness for surgery.

Stronger associations between psychological factors and joint replacement outcomes are reported in knee replacement than in hip replacement [163] and which may, in part, contribute to higher dissatisfaction rates and poorer response to surgery reported in recipients of knee replacement compared to hip replacement [164]. There is a dearth of literature examining the impact of psychological factors on actual response rates in joint replacement surgery. In addition, modifiable risk factors are likely to impede an individual's capacity to benefit from joint replacement. These factors should also be considered prior to referral and consideration should be given to whether it is feasible to mitigate this risk through intervention, such as body mass index [165], psychological distress [166], co-morbidity profile [167] etc. Willingness to undergo surgery has also been linked to misperceptions about the indications for, and risks and benefits of, joint replacement. Patient preferences and perceptions about treatment options may be addressed using a patient decision aid. This is designed to help patients' participation in the decision-making process by improving knowledge, creating realistic perceptions of benefits and harms, reducing decisional conflict, and improving the match between the chosen option and informed patients' values [168].

A few previously developed patient selection criteria for total joint replacement indicated there were still approximately 20-45% of patients' whose appropriateness for replacement was considered uncertain [169-171]. This makes these decision tools difficult to use in daily practice, as patients rated as 'uncertain' may have similar improvements in health outcomes as those rated as 'appropriate'. In addition, orthopaedic surgeons recognise the need for a decision aid to support their decision making for total joint replacement and to optimise communication with patients [172]. However, the uptake of decision aids among surgeons has been low. Surgeons' views regarding the development of a decision-support tool to standardise the assessment of patient appropriateness for surgery has raised some challenges. While most agreed that a tool may help guide discussions with patients and standardise the process, some indicated that their clinical experience was enough and that they are unlikely to find a tool useful [173]. Concerns were also expressed about mandatory cut-offs for patient-centred care and the medicolegal implications of using a decision aid [174]. An audit and feedback intervention before and after using a decision aid may be necessary for surgeons to gain confidence in its legitimacy [174].

Prioritisation criteria

To date, no strong evidence has been identified to support a specific tool for the determination of clinical urgency or the adequacy of joint replacement in people with advanced joint disease. The use of broad, non-specific groupings for the allocation of surgery is currently based on a system-wide category of utilisation of service rather than accurately defined health states. A number of international and national groups have attempted to develop acceptable tools for the clinical prioritisation of joint replacement surgery, but the validity and reliability of these tools remain uncertain. A systematic review identified 12 hip replacement and 10 knee replacement indication sets from 6 guidelines (including European League Against Rheumatism, National Institute Care Excellence, Osteoarthritis Research Society International and British Osteoarthritis Society) and 18 papers [175]. Indication criteria concerning joint replacement consisted of pain (in respectively 11 and 10 sets), function (12 and 7 sets), radiological changes (10 and 9 sets), failed conservative therapy (8 and 4 sets) and other indications (6 and 7 sets) [175]. It was shown that currently available joint replacement indication criteria are largely based on limited and low-quality evidence. Hence, empirical research is needed, especially regarding domain specific cut-off values or ranges at which the best postoperative outcomes are achieved for patients, taking into account the limited lifespan of a prosthesis [175].

A working group established by OMERACT/OARSI (Osteoarthritis Research Society International) attempted to categorise the severity of symptomatic osteoarthritis using identified domains of pain, functional status and structural damage to correspond with referral for joint replacement [176]. They concluded there was wide variability in surgeon's recommendations for joint replacement, but this was an important factor in who received surgery. While the level of symptoms was higher amongst people the surgeons referred for surgery, there was no cut-off point based on pain or disability to allow for discrimination between those referred for joint replacement and those who were not. A Canadian group developed the joint replacement priority criteria tool (HKPT) as part of the Western Canada Waiting List Project (http://www.wcwl.ca/tools/joint_replacement) [177, 178]. The tool ranks individuals according to the urgency for joint replacement [179]. While high and low categories of urgency were well discriminated, there was an overlap of adjacent urgency categories, suggesting further evaluation is required to assess the clinical validity of this tool. A priority criteria tool for joint replacement was also developed in New Zealand to provide consistency and transparency to the process of prioritising access to surgery [180, 181]. An Australian tool has been developed to determine appropriate access to surgical consultation: the Multi-attribute Prioritisation Tool (MaPT). It was developed by the University of Melbourne with support from the Victorian Department of Human Services (<http://www.health.vic.gov.au/surgery/pubs/owlsumrep.pdf>), and is designed to help prioritise and manage people considering joint replacement surgery. However, there was no published evidence that investigated the validity and reliability of the MaPT and hence it has not been recommended for use in the Victorian or Western Australian modes of care.

Priority 6 Implement non-surgical management of severe osteoarthritis in the community

There is a perceived lack of non-operative alternatives for the management of severe osteoarthritis which was highlighted by a sample of Australian surgeons [174]. A study among Dutch orthopaedic surgeons similarly documented a lack of confidence in the efficacy of non-surgical treatments associated with a decreased referral rate [182]. Nevertheless, meta-analyses of small studies have shown that pre-operative exercise interventions for patients with knee/hip osteoarthritis awaiting total joint replacement reduced knee pain (SMD: 0.43; 95% CI: 0.13, 0.73) [183] and hip pain (SMD: 0.45; 95% CI: 0.15, 0.75) and improved hip function (SMD: 0.46; 95% CI: 0.20, 0.72) .

There is limited research on the effectiveness of short-term non-pharmacological and non-surgical weight loss interventions prior to surgery either on pre- and post-operative outcomes or adverse events. Data from previous studies suggest an increased risk of deep surgical site infection and 90-day hospital readmission with a weight loss of $\geq 5\%$ over the year prior to total joint replacement [184, 185]. Results from a pilot study of 40 patients with BMI ≥ 30 indicated that a structured, dietician-led weight loss intervention prior to total joint replacement is more effective in achieving weight loss than usual care and resulted in a statistically significant improvement in self-reported physical function at 12 months post surgery [186]. However, there is no conclusive evidence to support the recommendation that obese patients lose weight prior to total joint replacement [187]. There were insufficient studies with distinguishable exercise and weight loss content to compare different types of exercise and dietary programs within patients with severe hip and knee osteoarthritis [187]. Hence, without further research, specific recommendations cannot be made regarding the optimal design of an exercise program to target weight loss.

Priority 7 Improve access, efficiency and cost effectiveness of services across healthcare systems for managing people with severe osteoarthritis

Direct health expenditure on osteoarthritis in Australia was more than \$3.7 billion in 2012 [12], of which 77% was spent on hospital services [24]. Despite the availability of public healthcare, ensuring timely access to care for osteoarthritis is problematic, as evidenced by the introduction of major government reforms to prioritise and “fast track” patients for total joint replacement and to optimise conservative management [14]. Several challenges have also been reported regarding accessing care for hip or knee osteoarthritis, including: medical opinions about delaying surgery, the appropriate age for total joint replacement, difficulty obtaining referrals or appointments, long waiting times, work-related issues, attitudes about non-operative care and limited availability of primary and specialist care in some areas [188]. Private health insurance was the most frequently cited enabler and was perceived to support the costs of surgical and conservative treatments, including physiotherapy, while facilitating faster access to surgery. Closer proximity to services and assistance from medical professionals in arranging care were also considered enablers [188].

Providing timely access to total joint replacement for osteoarthritis is a key priority for the Commonwealth government (National Arthritis and Musculoskeletal Conditions Advisory Group 2004, Department of Human Services 2005). In 2016–17, the median waiting time for orthopaedic surgery in public hospitals was more than 195 days for half of the patients admitted for total knee replacement and 110 days for total hip replacement. The median waiting time for total knee replacement was 251 days for Indigenous Australians and 193 days for non-Indigenous Australians [189]. In 2015–16, it was 164 days in major cities, compared to 230 days in inner regional areas, 251 days in outer regional areas and 187 days in remote areas [190].

There is a need for an effective and equitable prioritisation system that supports rational and efficient clinical decision-making, better delivery of healthcare, improved health service planning and resource allocation and patient choice. The current three-tiered system (urgent, semi-urgent and non-urgent) used by surgeons and their registrars to determine the priority of patients for total joint replacement surgery is relatively unstructured and insensitive to individual patient need. Importantly, high priority patients may not receive timely surgery [191]. Patients with severe osteoarthritis waiting for an appointment to see an orthopaedic specialist and those already waiting for surgery are not routinely reviewed and may experience physical and psychological deterioration while they wait for surgical treatment. Delaying surgery for extended periods can result in the deterioration of both physical function and overall well-being [192].

Surveys conducted in people on orthopaedic waiting lists have shown the uptake of non-operative options, such as physiotherapy and rheumatologic care, was very low or non-existent. Only around 20-28% of patients

have tried exercise or weight loss before being placed on the waitlist (Dowsey M. et.al 2018 unpublished data). The reasons for this may include: lack of knowledge about services by gatekeepers (i.e. GPs); lack of uptake of services by patients for financial reasons, difficulty accessing services, competing priorities, such as caring responsibilities; and insufficient capacity to meet demand in community health settings. A more equitable and clinically responsive system would ensure all conservative care options had been undertaken and those with the highest need (based on physical, functional, quality of life, economic and other issues) received prompt care [192]. Service configuration will need to be adapted to recognise local structural issues such as population and workforce geographical distribution, workforce capacity and professional linkages, information and communications technology resources, and access to evidence resources and facilities [149].

The evidence provided in this section served as the basis of the determination of priority areas of the Strategy, the implementation plans to address these priorities and the gaps in the existing research, which are summarised in the next section.

B. Enablers, Barriers and Horizon Opportunities

The enablers, barriers and horizon opportunities under each priority area are identified, which will be addressed during the implementation process to achieve the desired outcomes.

Enablers	Barriers	Horizon Opportunities
Common enablers, barriers and opportunities across the three thematic areas		
<ul style="list-style-type: none"> ● Capability: a multidisciplinary involvement with a diverse skill set and knowledge, multiple existing support bodies ● Environment: existing social influence such as mass media, healthcare body, internet; establish links to broader public health campaigns and promote lifestyle changes without specific disease focus ● Funding: public/private sector partnership & funding (of community-based activity programs and other local/national campaigns); a long-term budget commitment from the Australian Government to fund a multi-faceted implementation plan with strategies across the continuum of care for people with osteoarthritis; improved funding for research and communication strategies ● Stakeholder collaboration: cross-sector planning and collaborations between all stakeholder groups (education, health, infrastructure departments for public transport, parkland/green and recreation spaces, Federal and State governments, schools, universities and professional peak bodies); empower those who know how to change behaviour of large groups of people and who have done successful community campaigns ● Process: discussion with policy makers and government for increased funding; formulation of consortia/groups/change ambassadors to bring them on board as champions ● Education: improved consumer education materials and strategies promoting the benefits of conservative management and the value of exercise, healthy diet, healthy life choices; national public campaign to educate and change consumers views: consumers need to take ownership of their health conditions 	<ul style="list-style-type: none"> ● Capability: lack of public knowledge and behaviour regulation to implement strategy ● Motivation: lack of motivation in the setting of other busy social role or incentives for consumers ● Stakeholders: involvement with greater numbers of consumers; coordination between key stakeholder groups and common strategies; conflict of interest & priority between governmental departments ● Environment: achieving significant behaviour change to increase physical activity and improved diet to maintain healthy weight at individual and population level is challenging; lack of recognition & support for the important role that allied health practitioners play in the prevention and management of chronic diseases, including osteoarthritis. ● Resources: funding is required to implement and evaluate these strategies—need major Budget Proposals, including focus on chronic pain; competing with the extensive array of programs already available; funding conflicts: between federal and state governments and between different components of the health sector to work together to provide integrated care; re-allocation of appropriate resources to implement strategies; Private Health Insurance Funds and Health Insurance Commission rebates do not appropriately fund or rebate health services that are focused on prevention and self-management strategies; language barriers ● Timeframe: build partnerships and implement strategies (including to show results) require a long time; lack of investment in prevention or commitment to policy over any duration longer than a political term ● Culture & knowledge: psychology & attitude to pain & disability; patient expectation 	<ul style="list-style-type: none"> ● Underutilised community pharmacy can provide nationwide support to implement preventative and screening strategies; ● Incorporate standardization of osteoarthritis screening into undergraduate and primary care training in Australia

Enablers		Barriers	Horizon Opportunities
Priority 1	Implement multifaceted programs to prevent obesity and increase physical activity for the prevention of osteoarthritis		
<ul style="list-style-type: none">● Capability: involvement with existing stakeholder groups such as national obesity group and national physical activity group● Motivation: public beliefs about adverse outcome of obesity and inactivity● Funding: evidence of health cost benefit of preventative strategies to government for funding; get involved in obesity-focussed policy and strategy formulation to secure government funding incentives for promotion activity and weight control programs● Stakeholders: encourage health professionals to change mindset	<ul style="list-style-type: none">● Capability: lack of public knowledge and behaviour regulation to implement strategy● Motivation: lack of motivation in the setting of other busy social role/incentives for consumers and for prevention prior to pain and disability● Environment: availability of junk food, car as transport tools, over reliant on technology, cost (healthy fresh food vs unhealthy fast food); lack of true leadership at government levels and political support; community fatigue in relation to obesity messaging and interventions—need to identify influential ambassadors and design comprehensive community-based programs; private hospitals receive large funding to do prevention programs but primary care could do with a fraction of what they receive; lay press and non-evidence based therapies, especially Non-Therapeutic Goods Administration (TGA) approved 'natural therapies'● Culture: requires massive shift in societal attitudes and possibly changes to employment organisational structures (e.g. sedentary workplace); community perceptions about osteoarthritis (e.g. 'you don't die from it') & about responsibility for own health● Stakeholders: food industry/lobby groups (e.g. sugar and alcohol) will resist adoption of lifestyle changes; political wills from governments and leaders of institutions is needed but this is influenced by economies, self-interests and competing priorities; the reality of the economic and social cost of an inactive and unhealthy population	<ul style="list-style-type: none">● Environments: for decisions to made focusing on conservative management/prevention● Culture change: community activities, sporting and other subsidised programs for vulnerable/at risk populations.● Process: greater emphasis on dietetics as well as physical activity; better application of the potential economic opportunities in reducing osteoarthritis and its sequelae● Program: national physical activity accredited programs which can be run by NGO's as well as health professionals.	

Enablers		Barriers	Horizon Opportunities
Priority 2	Adhere to joint injury prevention programs		
<ul style="list-style-type: none">● Capability: involvement with groups in the field of sports medicine and utilise existing executive board of sports bodies with skill and capability in behaviour regulation● Motivation: healthcare professionals and sports bodies’ beliefs about the consequence of sports injury; social role/identity of healthcare system and sports bodies to protect players● Environment: existing system such as referee, rules/policies in sports; social influence such as training program, mass media, internet	<ul style="list-style-type: none">● Capability: general public's lack of knowledge about the consequence of sports injury● Motivation: role and identity of the player (e.g. to win)● Environment: nature of the game with high impact sport (i.e. to win); culture of sports; young people’s perception (see it as an older person's condition); workplace issues for professional sporting bodies; duty of care to drive practice change with body of documented evidence; changes from professional bodies have a flow-on effect to all levels of sport; linking injury to osteoarthritis may have potentially negative impact on physical activity, especially risk-averse parenting; community perception that injury is part of sport and osteoarthritis inevitable as a result; lack of evidence/knowledge around what exercise (i.e. incidental or intense) will reduce the risk of obesity and reduce the risk of osteoarthritis; lack of awareness of the effectiveness of injury prevention strategies especially in sport and workplace settings; encouraging sporting activity to prevent obesity will increase injury● stakeholders: lack of interest by sporting bodies/physical activity organisations; disparate government departments; challenges around getting the many agencies that need to be involved in these strategies to prioritise initiatives focused on injury prevention in a meaningful way● Resources: lack of funding & high cost particularly to oversee the quality of training programs; cost of children's organised sporting activities (e.g. incentives); high level of volunteers in local sporting clubs currently● Sustainability: Training needs to be ongoing and programme/guidelines need to be updated regularly● Target population/activities: a national level programme may not have relevance for all demographics of children playing all sorts of different sports; not all sporting groups have formal trainer pathways● Care needs to be taken when delivering messages regarding the role played by sports injuries in the development osteoarthritis: an overemphasis on the risk posed by sports injuries may act to reduce rates of 'vigorous' physical activity due to a fear of joint injury	<ul style="list-style-type: none">● Capability: injury management linked to sports association funding agreements (note: this only works at the higher levels)● Better measurement of rates of injury and evidence to support reductions● Research: MRFF or other funding bodies to provide research funding; Research to be canvassed to government to promote education● Resources: existing sports bodies, clubs, schools, mass media; health dollar savings possibly very high; existing programs, education, coaching, and prevention resource materials● Integration of priority as pillar of the Exercise is Medicine programRegulation of fitness industry	

Enablers	Barriers	Horizon Opportunities
Priority 3 Support primary care practitioners to deliver high-value care to people with osteoarthritis, including increased prescription of lifestyle interventions		
<ul style="list-style-type: none"> ● Capability: multidisciplinary involvement with a diverse skill set and knowledge to support effective self-management ● Motivation: the role and identity of healthcare provider to provide evidence-based care ● Environment: existing evidence-based guidelines; utilising existing models and use what we have learned from these; update with current research refreshes healthcare practitioners; national benchmarking will have benefits across health and fitness industries and benchmarking strategies are generally well accepted by governing bodies to maintain excellence (e.g. Wollongong university for the electronic Persistent Pain Outcomes Collaboration (ePPOCC) outcome data—an existing national benchmarking services) ● Funding/costs: the cost of obesity and its association with chronic health conditions; funding of conservative care options ● Compulsory conservative management before surgery. ● Stakeholders: work with practice nurses and managers; mentor groups or peer discussion groups, the networks of the members of the implementation committee; establishing a Centres of Research Excellence (CRE) or similar; change management and training for GPs; promote conservative management over joint replacement and the adoption of goal setting practices, creation of individualised plans and identification of risk factors amongst healthcare professionals 	<ul style="list-style-type: none"> ● Capability: there is a need for skilled person to deliver program for self-management. ● Motivation: little incentive for primary care providers to take a genuine interest in managing osteoarthritis adequately beyond completing General Practitioner Management Plan (GPMP) for revenue or practice compliance purposes; surgeons have greater vested interest in surgery; further benchmarking will incur extra workload ● Environment: lack of coordinated interdisciplinary team approach in the current paradigm of care; clinic inertia: health practitioners stuck in their old ways; referral patterns and reimbursements; funding models (should push for availability within current funding model for establishing community pharmacy involvement through professional service program similar to medcheck and diabetes medcheck); problem of unscrupulous companies that promote non-evidence-based treatments for osteoarthritis and undermine and conflict the messages about appropriate management; change the current healthcare landscape to accept and promote conservative management over surgery; lack of recognition of the importance of non-surgical management of osteoarthritis by health departments and government; lack of evidence-based patient guidelines ● Culture: desire by consumers for a passive fix and referral mentality among some health professionals—need to shift both the health professionals’ and consumers’ thinking to embrace conservative management, including barriers and financial incentives for low value interventions; patients and health professionals feel changes to lifestyle measures to improve pain and function are hard and difficult 	<ul style="list-style-type: none"> ● Coordinated care incentives ● Outcome audits ● National self-management program ● Reflect in GP training in the future ● Resources: make use of existing resources and social influence: education program for trainees, continuing education for healthcare professionals and existing resources to set up benchmarking database ● Practice specific 'specialists' in primary care setting. ● Long-term benefits if workforce training can be influenced ● Incentivising of multi-disciplinary teams and care in primary care and community programs ● Linked chronic disease activity programs addressing osteoarthritis but also falls, cardiac, respiratory health and survivorship

Enablers	Barriers	Horizon Opportunities
<ul style="list-style-type: none"> ● Patient-initiated programs ● Registers and agreed patient outcome, experience, appropriate care measures ● Eligibility criteria for high cost surgical options ● Change the way health is funded to outcome-based ● Effective implementation structure, system, program e.g. policy development based on evidence-based strategies, national campaign, state/local action plan, funding for this initiative, surveillance system for goal attainment 	<ul style="list-style-type: none"> ● Resources: infrastructure funding; health professionals have limited time to counsel patients; difficulties and cost in changing established training programs; the promotion of misinformation; reliance on community funded and volunteer programs for activity; lack of affordable options in the community; varying degrees of primary healthcare knowledge, time, and access to services such as dieticians; implementation in a public health setting with limited resources; lack objective tools to guide recommendations to patients; patients who do some exercise don't have objective assessment of their effectiveness, which decreases adherence; decision leading to joint replacement are mostly based on radiological findings and pain; ● Pain management: consumers will avoid physical activity because it's painful and not take advice from their doctor or other health professional; medicine options for pain management have a limited role, for example paracetamol provides minimal pain relief, NSAIDs maybe more effective than paracetamol for some patients but have greater potential for harm, and opioids have modest, if any, benefits and significant potential for harm ● Psychological distress: psychosocial issues/environmental vulnerability on self-management approaches—this in turn impacts the ability of individual to be confident/skilled in advocating their needs within a health system in order to uptake appropriate lifestyle interventions 	<ul style="list-style-type: none"> ● Technology: education and remotely delivered exercise and coaching interventions

Enablers	Barriers	Horizon Opportunities
Priority 4 Improve the uptake of evidence-based and affordable, tailored, non-surgical care and support for ongoing self-management by all Australians with osteoarthritis		
<ul style="list-style-type: none"> ● Capability: we have multidisciplinary involvement here with a diverse skill set and knowledge to guidance to evidence-based care, self-management and inter-disciplinary care. ● Motivation: role and identity as a healthcare provider and to give evidence-based care. ● Environment: existing structure for interdisciplinary care, self-management program, outreach program and culturally and linguistically diverse populations (CALD) program; efficient delivery modes for health promotion ● Funding: special funding for rural health initiatives; community programs, outcomes and high-value interventions; integrated and innovative funding models across state and federal programs for prevention; funding to Primary Health Networks for Bio psychosocial support interventions. ● Marketing: social media marketing; consumer champions; 	<ul style="list-style-type: none"> ● Capability: lack of consumer knowledge on high-value care and self-management. ● Motivation: believe about lack of resources and capability to increase a access to the currently already outstretched interdisciplinary service ● Environment: Lack of current resources, trained personnel to deliver outreach program and education program for CALD clients; Disease-specific approach to prevention and competing priorities; political will; organisations still trying to work out how to build health coaching into their system and work flows; Lack of equitable access to specialists ● Resources: lack of rural and remote healthcare providers: both public and private; lack of support services for CALD communities in rural areas; needs substantial funding from already tight regional pool; prescription of lifestyle interventions requires sustained long-term management and regular feedback; lack of inclusion of psychologists in healthcare teams ● Stakeholders: challenges reaching and engaging consumers; ● Technology: using an internet, telehealth delivery platform for a biopsychosocial intervention programme. ● Geographic distance 	<ul style="list-style-type: none"> ● Development of a rural osteoarthritis Outreach Service ● Social media videos ● MRFF research funding ● Existing resources: Chronic Disease Management Plan, mental healthcare plan ● Rural service delivery is an issue for many health conditions. ● Developing common infrastructure may support good funding (telehealth) & platform of individualised options to access conservative care. ● Design programs for people with multimorbidity not just osteoarthritis

Enablers	Barriers	Horizon Opportunities
Priority 5 Optimise decision-making processes leading to total joint replacement surgery and maximise client outcomes following total joint replacement surgery for people with severe osteoarthritis		
<ul style="list-style-type: none"> ● Capability: we have multidisciplinary involvement with a diverse skill set and knowledge ● Motivation: Social role/identity as a healthcare provider to provide evidence-based care and interdisciplinary care ● Environment: existing system such as continuous professional education; healthcare database management system; and system for guideline; access to use existing patient data bases; the government may be willing to fund the initiative because hospital waiting lists is an important matter ● value of data collection is increasingly recognised across the spectrum, so this is likely to get wide support ● Agreed measures and uniform IT systems and registries ● Public and private hospital agreements and commitment to share outcomes ● Integrate these informed decision making approaches into already existing platforms like Choosing Wisely Australia 	<ul style="list-style-type: none"> ● Resources: delivery channels (multiple problems nationally with e-health); Some of these advanced care strategies are outside the scope of allied health such as community pharmacy; current Fragmented non interoperable ICT systems and ICT-enabled strategies take time to implement ● Capability: difficult to regulate behaviour and change practice paradigm; surgeons may be resistant to using a standardised approach to joint replacement; lack of willingness to undertake new ventures ● Motivation: rigid beliefs about current structure of care; and resistance to change; clinical providers, many working in the private system may not be amenable to decision aids ● Environment: culture of quick fix, and resistance of patient currently on waiting list; disinterest and ignorance in the GP community ● Local vs national: state health system differences, consistency of measures; standardisation can lead to issues with adapting to local context, population and workforce needs 	<ul style="list-style-type: none"> ● National decision aid tools ● Consumer directed directories ● This could streamline waiting lists for joint surgery and could improve outcomes through selection of appropriate candidates. ● opportunities to improve care with data collection ● National registries with benchmarked outcomes designed to inform patients and support decisions ● Choosing Wisely Australia

Enablers		Barriers	Horizon Opportunities
Priority 6	Implement non-surgical management of severe osteoarthritis in the community		
<ul style="list-style-type: none">● Capability: multidisciplinary involvement with a diverse skill set and knowledge to guide evidence-based care, self-management and inter-disciplinary care● Motivation: role and identity as a healthcare provider and to give evidence-based care; the escalating costs associated with increasing numbers of joint replacements and an ageing population● Environment: existing structure for interdisciplinary care, self-management program, pain program; rural delivery framework (web, training); enhanced consumer education and awareness● Resources and process: national accreditation process for arthritis educators	<ul style="list-style-type: none">● Capability: regulating behaviour around change of treatment paradigm; Referral pathways; hospital-centric care; reforms at the hospital level would be more in the realm of state governments, rather than the Commonwealth● Motivation: beliefs about lack of resources and capability to increase an access to the currently already overstretched interdisciplinary service; Clinical inertia; consumer resistance and the surgeon's need to meet consumer expectations about surgery● Environment: lack of current resources and funding model for effective interdisciplinary care● Resources: resources to train and increased clinical load; barrier across federal and state programs; funding to surgical management needs to change● Healthcare System: current referral and orthopaedic waiting list practices prevent people with severe osteoarthritis from self-referring to non-surgical management services (such as physiotherapy) within the public sector health system and represent a significant barrier to accessing non-surgical management; current referral systems make it easier for GPs to refer patients to orthopaedic surgeons than to refer directly to non-surgical management; the current limit of only five MBS funded sessions via the Chronic Disease Management and Team Care Arrangement Schemes is insufficient and prevents GPs and patients with osteoarthritis utilising high-quality non-surgical management available through local allied health private practice services and increases strain on the acute public hospital system● Pain: experienced by consumers—severe osteoarthritis less likely to respond to behavioural change alone and likely better aligned to Pain Clinic programs	<ul style="list-style-type: none">● More funding for preventative health promotion services● Standardised pathways and criteria for surgical intervention● Better access to care and less joint replacement surgery.● Models of care support long-term benefits● Blurring divide between hospital and primary care programs and funding● A model or pathway that recognise the whole person, family, carers not just a body part	

Enablers		Barriers	Horizon Opportunities
Priority 7	Improve access, efficiency and cost effectiveness of services across healthcare systems for managing people with severe osteoarthritis		
<ul style="list-style-type: none"> ● Capability: multidisciplinary involvement with a diverse skill set and knowledge to guidance to timely care for joint replacement surgery and for non-surgical management. ● Motivation: role and identity as a healthcare provider and to give evidence-based care; government are interested in reducing waiting lists ● Environment: existing structure for interdisciplinary care, including surgical and self-management program, pain program; existing programs and partnerships; current clinical training, health navigation and gate-keeping, team-based care ● Stakeholders: drive the work with local state governments using existing local/jurisdictional models of care and leadership in direction from the Commonwealth; public and private commitment to optimisation ● Models: Multidisciplinary, multimorbidity whole of person focused community services 		<ul style="list-style-type: none"> ● Capability: regulating behaviour around change of treatment paradigm. ● Motivation: beliefs about lack of resources and capability to provide timely joint replacement surgery and non-pharmacological management given the lack of resources; consumer resistance ● Environment: lack of current resources and long waiting list for joint replacement surgery; Ingrained specialist silos; pain experience of living with osteoarthritis and wanting a quick fix; lack of funding model and resources for effective interdisciplinary non-surgical care for severe osteoarthritis, in particular, severe pain and distress; availability of specialist trained staff to assess patients; service provision challenges for rural and remote areas; treatment guidelines operation vs non-operations for upper limb arthritis; challenges with managing upper and lower limb co-pathology ● Stakeholders: surgeons would need to support any system that involves management of advanced care patients; jurisdictional-based strategies require national consensus/leadership to achieve desired outcomes due to the divide between state and Commonwealth ● Systems: standalone musculoskeletal health services would add to the further fragmentation of an already fragmented system 	<ul style="list-style-type: none"> ● Long-term opportunities if musculoskeletal health centres are established ● Hospital outpatient departments may no longer be required/ can be downsized, which allows funding shifted to community settings. ● Implementation of ECHO Hubs for integrated care

C. Public Consultation

The strategy received 176 public submissions from across all states/territories in Australia and the globe (Figure 5). Nearly three quarters are health practitioners, 21% from consumer, and 8 % from researchers. Their main area of focus is osteoarthritis (57%), regional conditions (e.g. back, neck, shoulder and so on, 19%) and inflammatory arthritis (13%).

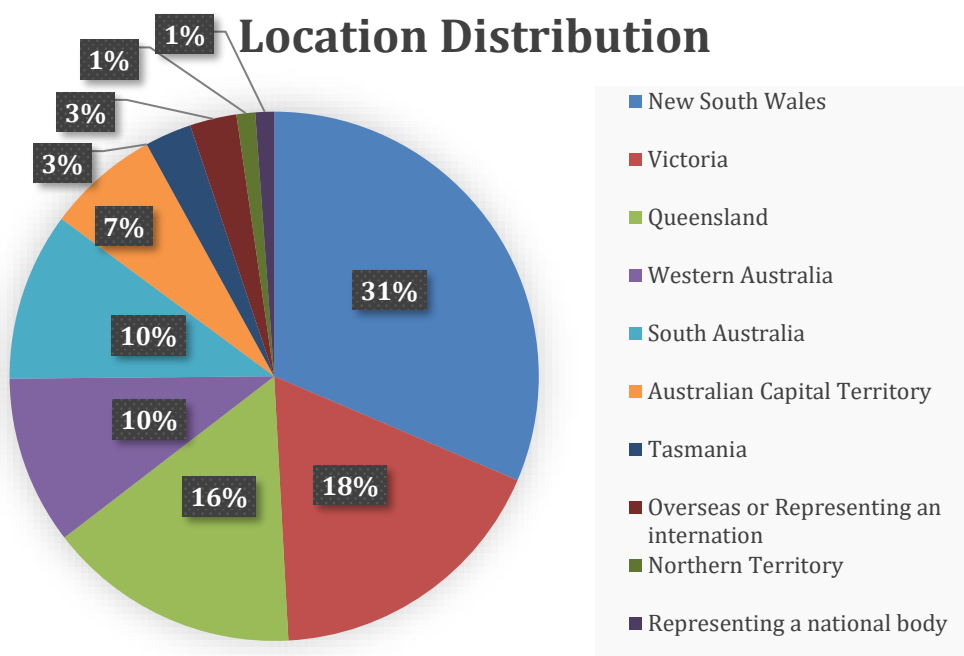


Figure 5 Locations of responses from the public

The overall feedback is very positive, and the priority areas identified in the Strategy have been validated by the Implementation Committee and the public. Some topic areas have been considered and discussed amongst the Working Group, but were not selected based on the importance matrix scoring. Some of these topic areas were also suggested by the public such as:

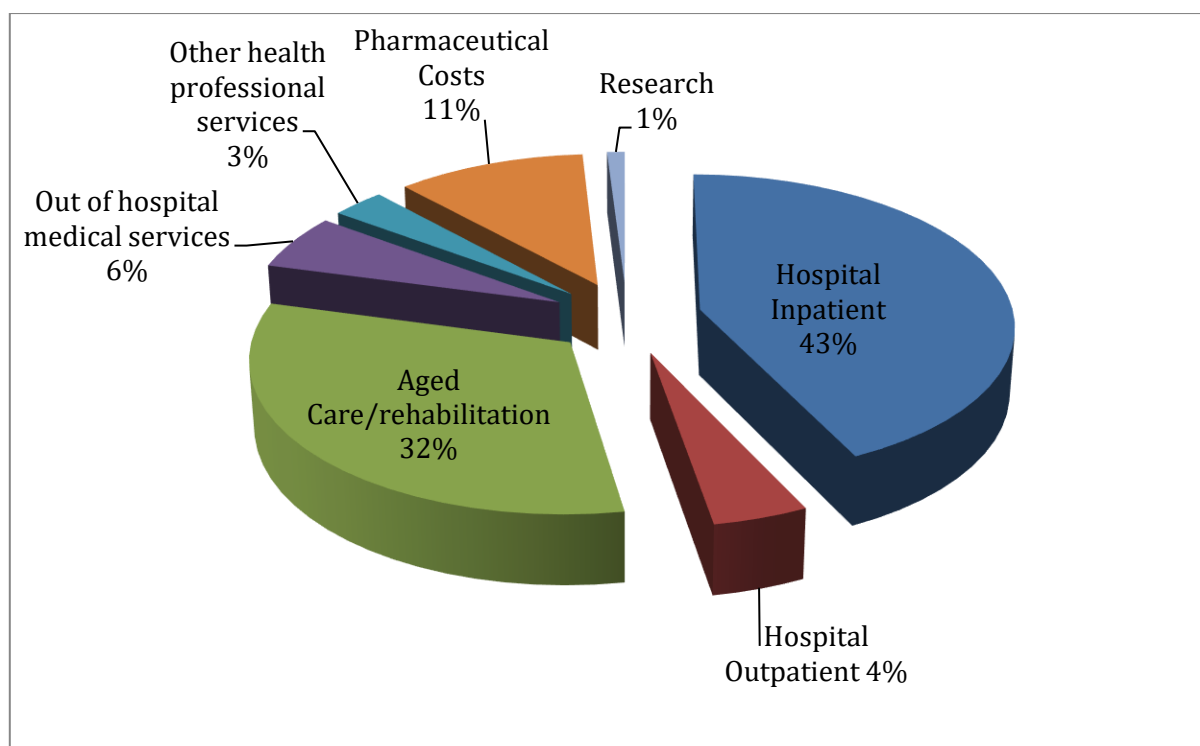
- Gaps in the evidence for non-surgical management of osteoarthritis: there are no well-defined disease-modifying treatments available to bridge the gap between the role of exercise and weight reduction in prevention and the role of arthroplasty surgery for end-stage disease.
- Multimorbidity: there is a need to enhance people's understanding about the treatment of comorbid conditions, the biopsychosocial nature of pain and the psychosocial aspects of pain. A large proportion of people with osteoarthritis will have multimorbidity and they would benefit from being seen by people who have expertise in looking after people with multimorbidity, polypharmacy, functional problem and so on.
- Pain management & literacy education: consumers need to be able to articulate the experience of pain as a measure of the perceived need to protect. People will more likely engage with exercise and active management rather than seeing their joint as a failed situation that won't improve until it is replaced. For those who have total joint replacements, more psychological assessment is needed to help identify people who are at risk of developing a persistent pain condition after surgery. Managing drug dependency (e.g. opioids) and upskilling pain literacy within treating health practitioners and the general public are also needed.

- Upper limb osteoarthritis (e.g. shoulder, elbow and hand): reference to surgery is predominantly to joint replacement surgery. This is minimal in the spine or hand surgery. Equivalent procedures such as Total Wrist Arthrodesis, Trapeziectomy, thumb MCP fusion and finger PIP/DIP fusion should be considered.
- Risk factors (in addition to obesity): identification of risk factors which predispose to osteoarthritis and those individuals most at risk and strategies to minimise the risk factors could be considered.
- Mental, emotional and psychosocial factors: include mental, emotional and psychosocial preparation for surgery to increase recovery outcomes and reduce costs of medical and pharmacological interventions; emotional responsiveness to condition/pain; counselling for psychology, cognitive-behavioural therapy, dieting and exercise; importance of good mental health to manage and treat the pain and suffering of those with arthritis.
- Identifying and providing management to people with early-stage osteoarthritis to maintain function and quality of life longer.
- Promising results for pentosan polysulfate.
- Optimisation of surgical interventions procedures in joints for the treatment of injured soft tissue.
- To include an objective assessment of mechanical markers of osteoarthritis progression in the care plan.
- Identification of pre-existing congenital, developmental or traumatic joint problems i.e. distinguish between idiopathic and secondary osteoarthritis.
- Genetics.
- Prevention of cartilage damage—prime issue in osteoarthritis.
- Research into the cellular mechanisms of osteoarthritis and possible interventions.
- Research into new medical therapies and drugs.
- Research to find Cause(s) and then Cure for arthritis.
- Prevention Research area: Further research into early surgical and/or conservative management of joint and other sports injuries.

D. Economic Analysis of the Strategy

Economic cost of osteoarthritis

The total economic cost of osteoarthritis consists of direct health costs and indirect costs. In general terms, most of the direct costs of osteoarthritis are usually attributed to hospital stays and specifically elective orthopaedic surgery, with smaller proportions accounted for by medications, physician visits, other health professional visits and diagnostic procedures [193] (Figure 6).



Source: Access Economics, 2013

Figure 6 Distribution of osteoarthritis healthcare costs

Although considerable attention is given to measuring direct healthcare costs, the indirect costs due to work loss and premature retirement are also substantial and often ignored when considering disease burden [194]. Arthritis is the condition responsible for the second highest number of older Australian workers retiring prematurely [195]. Of those aged 45 to 64 years who identify arthritis as their main health condition, 50% are not employed. Nationally, there was an annual loss of \$3.8 billion in private income to people aged 45–64 years, but an additional \$291 million outlay in social security payments and \$394 million less in personal income tax [196]. Arthritis contributed 17% of the total \$2.1 billion of taxation revenue lost to government in Australia in 2009 from illness-related early retirement, and 19% of the total \$1.5 billion in government support payments to those who retired early due to illness [197]. The aggregate national impact of early retirement due to arthritis includes \$9.4 billion in lost gross domestic product, attributable to arthritis through its impact on labour force participation [196].

A recent Australian study estimates the lost GDP owing to missing workers (lost income, lost tax, and welfare payments) due to arthritis to be 0.4%. These indirect costs are attributed to productivity losses from absenteeism (time lost from work, e.g. sick days), presenteeism (loss in productivity even when the person is at work), premature death and early retirement (reduced income and taxation revenue), as well as compensation for household work performed by others [193] (Figure 7).

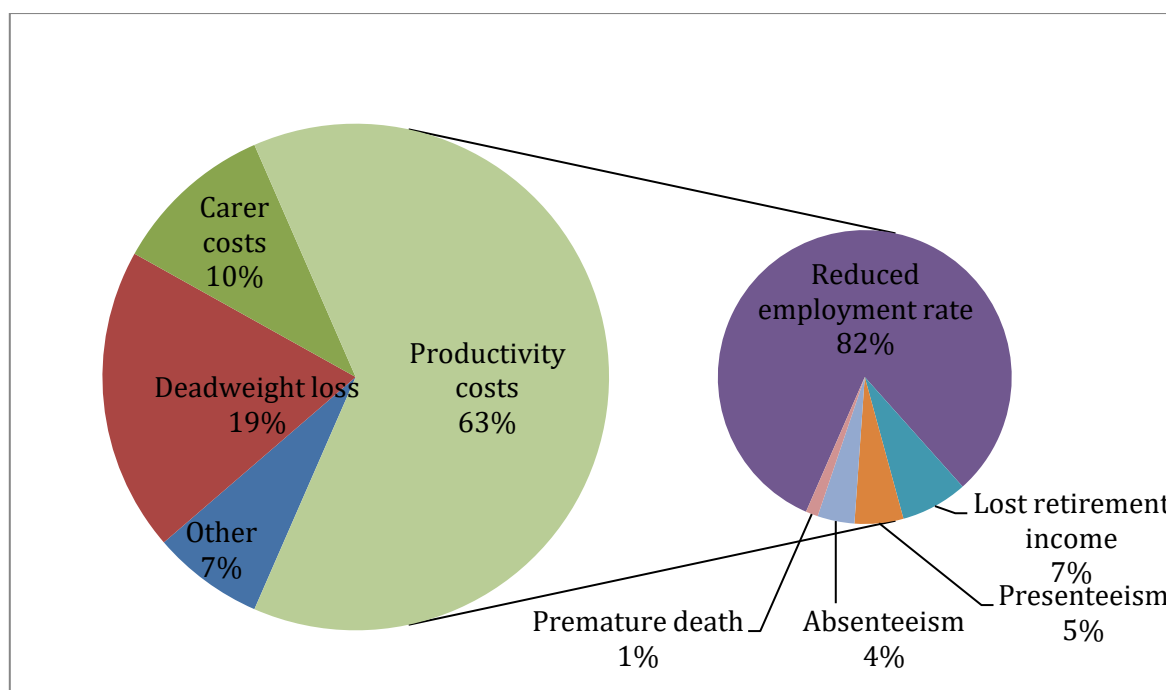


Figure 7 Distribution of indirect costs for osteoarthritis by kind. The graph on the left shows the allocation of the indirect costs of the disease. The graph on the right further breaks down the costs associated with productivity losses.

The overall economic cost of osteoarthritis in Australia was estimated to be \$8.5 billion (\$ 4,387 per patient) in 2012, consisted of direct healthcare costs of \$3.8 billion and indirect costs of \$4.8 billion [12] (Table 3).

Table 3 Estimated indirect costs of Osteoarthritis

	2012 Indirect Cost*
Productivity costs	
Reduced employment rate	\$ 2,5B
Lost superannuation	\$ 223M
Presenteeism	\$ 162M
Absenteeism	\$ 123M
Premature death	\$ 41M
sub-total	\$ 3B
Other indirect costs	
Deadweight loss	\$ 930M
Carers	\$ 496M
Aids and home modifications	\$ 226M
Program	\$ 82M
Travel	\$ 32M
Funeral	\$ 2M
TOTAL indirect cost	\$ 4,8B

* Estimate based on 40.9% of all musculoskeletal indirect costs (Source: Access Economics, 2013)

The economic costs of osteoarthritis could reach \$27 billion in 2032 if the observed trend in the past ten years continues. The direct health costs related to arthritis is projected to increase from more than \$5.5 billion in 2015 to more than \$7.6 billion by 2030 in Australia [22] and the impact on the labour force is estimated to be

a loss of \$7.2 billion in GDP for 2015 to \$9.4 billion in 2030. National costs due to arthritis consisted of a 50% increase in loss in annual personal income (from \$1.7 billion in 2015 to \$2.6 billion in 2030, 23% increase in extra annual welfare payments (from \$635 million in 2015 to \$784 million in 2030) and 12% increase in lost annual taxation revenue (from \$458 million in 2015 to \$660 million in 2030).

Potential return on investment

Investing in osteoarthritis has a huge potential of return on investment. It's been estimated that implementation of research-derived strategies could generate significant economic savings to Australia (decrease in health costs and increase in productivity). Reducing the osteoarthritis burden with state-of-the-art medical research and clinical services will also address the Australian demographic challenge of increasing economic growth by ensuring Australians maintain the capacity to work productively if they chose ([21]).

Obesity is the most important modifiable factor for osteoarthritis and 25% of osteoarthritis is caused by obesity. Reducing obesity by 5% by 2050 would translate into 21,250 less Australians with osteoarthritis and possible savings of \$356 million annually (Table 4).

Table 4 Reducing obesity and possible savings annually.

	Prevalence	Number of	Total economic cost	Net savings
For 2050	of osteoarthritis	patients	(in billion)	(in billion)*
Baseline case**	10.70%	3,142,000	\$ 52.6	
5% reduction	10.63%	3,120,750	\$ 52.3	\$0.4
10% reduction	10.56%	3,099,500	\$ 51.9	<u>\$0.7</u>
25% reduction	10.35%	3,035,750	\$ 50.9	<u>\$ 1.8</u>

* Based on Access Economics (2007) data, Costs of the obesity reduction program were not taken into account in these estimations

**Baseline case: obesity prevalence is steady—the projected prevalence of osteoarthritis under the base case is 10.7% of the population in 2050

Approximately 50% of ACL injuries will lead to osteoarthritis within 10 years. Implementation of a modestly effective injury prevention program that reduces knee injury rates by 30% would cost the Australian community \$1.3 million per year to implement but could save \$113 million per year. The program can be readily implemented by leveraging existing resources (Table 5).

Table 5 Implementing a knee injury prevention program could save \$113m per year to the economy and prevent 11,000 Australians having surgery.

	Average health cost per patient	Estimated reductions in interventions	Net savings annually due to the reduction in interventions (in millions)	Estimated reduction in future total economic cost due to osteoarthritis
Knee replacements	\$20,000	2,318	\$46	\$53
Knee arthroscopies	\$5,000	6,000	\$30	\$34
ACL reconstruction	\$6,223	3,000	\$23	\$26
TOTAL		11,318	<u>\$99</u>	<u>\$113</u>

Implementation of a conservative management program that reduces pain by 40% amongst osteoarthritis patients will lead to major cost savings. Our preliminary studies suggest that if we focus only on high-risk patients (10% of osteoarthritis patients who generate 60% of healthcare cost) at an average cost of \$700 per patient, a national program would cost \$136 million. Net savings to the health system would be \$764 million.

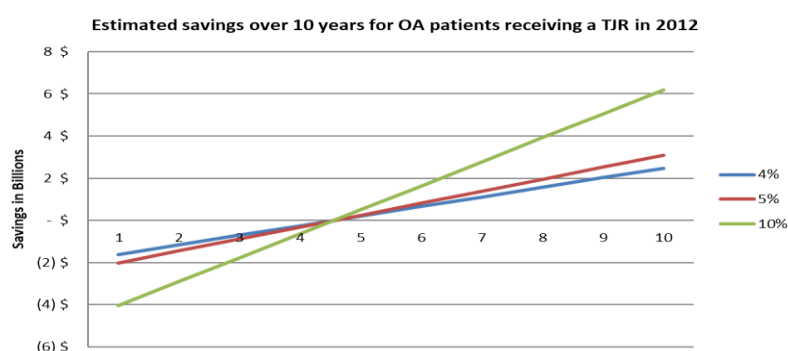
Net savings to the economy would be \$1.9 billion with significant additional savings from labour force retention (Table 6).

Table 6 Implementing a Multi-Disciplinary Disease Management Program could save \$2B annually to the Australian economy

	Average cost per patient	Cost of program annually (million)	Net savings to the health system annually (million)	Net savings to the economy annually (billion)
For all osteoarthritis patients	\$700	\$1,362	<u>\$137</u>	<u>\$2.1</u>
For high risks patients only*		\$136	<u>\$764</u>	<u>\$1.9</u>

*High risks patients: 10% of osteoarthritis patients who generate 60% of healthcare cost

Both hip and knee replacements have been shown to be cost-effective in the Australian context. In 2012, there were 79,725 total knee and hip replacements caused by osteoarthritis. Increasing the number of Total Joint Replacement (TJR) amongst osteoarthritis patients is not a cost-saving intervention in the short-term and clinical research is needed to develop the best strategy in patient selection. The estimated savings over 10 years for osteoarthritis patients with 4% , 5% and 10% of osteoarthritis patients receiving a knee or hip replacement in 2012 are displayed in the following Figure (Based on an estimated cost of joint replacement per patient \$20,000 and 10 year implant survivorship).



Funding for osteoarthritis research and clinical services represent an investment with a guaranteed positive return. Arthritis Australia has estimated that \$150m over five years would represent an adequate research level for all arthritis research.

Table 7 Positive Return of Funding for Osteoarthritis Research and Clinical Services

Scenarios	Cost of program per year (millions)	Estimated net savings (total economic cost)	Implementation
Disease management	\$136	\$2B per year	Easy
Sport injury prevention	\$1.3	\$113M per year	Easy
Obesity reduction	No available data	\$356M per year (2050 figures)	Can be challenging
Joint replacement	\$195	\$3B over 10 years	Can be challenging

E. Environmental scan

An environment scan was conducted to map various systems, supports, and other resources related to osteoarthritis self-management and treatment currently available to people with osteoarthritis as well as the financial environment of the funding streams currently used by health service providers and communities in Australia. Given the multiple sources of data, varying target populations, and types of knowledge, this environmental scan is not meant to provide an overarching framework for the Strategy, but serves to identify the services and programs that currently exist to assist the discovery of gaps or duplicative efforts between different programs. It entailed a combination of an exploratory search on the relevant websites, a short survey and interviews with key stakeholders. The environmental scan provides an evidence-base to support decision-making and develop implementation plans to address the priority areas relating to osteoarthritis prevention and treatment care.

Available Public services and services from NGOs

National-level services

[Arthritis Australia](#) (AA) is the peak arthritis body in Australia. It is supported by affiliate offices in ACT, New South Wales, Northern Territory, Queensland, South Australia, Tasmania and Western Australia. AA provides support and information about arthritis and other musculoskeletal conditions including self-management, community programs, seminars, support groups and resources to people with arthritis, promotes awareness and offers resources for healthcare professionals.

[Painaustralia](#) is the national peak body aiming to improve the quality of life of people living with pain, their families and carers, and to minimise the social and economic burden of pain. Pain Australia work with governments, health professional and consumer bodies, funders, educational and research institutions, to facilitate implementation of the [National Pain Strategy](#) in Australia.

The [Australian Rheumatology Association](#) supports and educates members and other practitioners in the musculoskeletal field to enable provision of the best possible management for patients. It fosters excellence in the diagnosis and management of musculoskeletal and inflammatory conditions through training, professional development, research and advocacy. It provides condition and medication information for patients

[Osteoarthritis management now](#) led by NPS provides information on the diagnosis and appropriate treatment of patients with osteoarthritis, including optimising care strategies before considering pharmacological management.

[Safe Sports](#) for Kids is a program designed to reduce the frequency of knee and lower limb injuries in young athletes. It aims to raise awareness and funding from the Federal Government for a universal Youth Sports Injury Prevention Program is currently in plan. The [Australian Sports Injury Data Dictionary](#) provides guidelines for injury data collection and classification for the prevention and control of injury in sport and recreation.

National Prescribing Service MedicineWise Educational Visiting Program is facilitated by the PHNs and recently promoted and delivered free educational visits for GPs, Practice Nurses and Pharmacists on the topic of Osteoarthritis: practical tools for diagnosis and management.

[HealthDirect](#) provides information for patients on a variety of health conditions.

Many professional peak bodies, associations and NGOs also provide relevant information or programs relating to physical activity, occupational therapy, diet, weight loss and so on:

- Australian Physiotherapy Association physiotherapy.asn.au

- Exercise and Sports Science Australia essa.org.au
- Occupational Therapy Australia otaus.com.au
- Dietitians Association of Australia <http://daa.asn.au>
- Independent Living Centres Australia <http://ilcaustralia.org.au>
- Action plan for Pain Australia
- Arthritis Australia: arthritisaustralia.com.au
- Osteoarthritis: myjointpain.org.au and healthinsite.gov.au
- Australia Dietary Guidelines: eatforhealth.gov.au
- Weight loss information: 8700.com.au and measureup.com.au
- Australian Psychological Society: psychology.org.au
- Advice for quitting smoking: <http://quitnow.gov.au/>

State-based services and Model of Care

Arthritis Australia has affiliate offices in ACT, New South Wales, Northern Territory, Queensland, South Australia, Tasmania and Western Australia providing education, information and support services for people living with arthritis and professional development and education for health professionals in their respective states. In addition, some states have their own Models of Care or relevant programs to promote healthy ageing and physical activity.

New South Wales

The Agency for Clinical Innovation (ACI) Osteoarthritis Chronic Care Program (OACCP) Model of Care [41] aims to reduce pain, improve function and quality of life, and to achieve optimum outcomes for the conservative care patient group and those proceeding to surgical intervention diagnosed with osteoarthritis conditions. The program integrates physical therapy, dietary advice and analgesia through an inter-disciplinary, conservative management model for individuals with osteoarthritis. It involves assessments and reviews over the course of a year, including musculoskeletal assessment, review of evidence-based conservative treatment options, exercise classes, hydrotherapy, fall prevention programs, Get Healthy phone service, physiotherapy, education sessions and other community-based programs, on-site OACCP services including dietetics/nutrition services, weight loss, psychological health, social situation and preparing for surgery. The OACCP has been trialled with over 6,000 people who were on the waitlist for elective hip or knee joint replacement due to advanced osteoarthritis. As a result of this program, 11–17% of people with knee osteoarthritis (depending on site) and 4% of people with hip osteoarthritis were removed from the surgical waitlist [198]. All NSW Local Health Districts are required to implement the OACCP program and a trial of an Integrated Local Musculoskeletal Service is also being undertaken. Primary Health Networks also worked with the Local Health District and the NSW ACI to implement the Musculoskeletal Primary Health Care Initiative.

[ACI Opioid Quicksteps](#) provides information on how to manage chronic pain in primary care.

Various outreach multidisciplinary clinics are also run regularly in hospitals and community health centres in NSW. In addition, [Hunter and New England Health Pathways](#) provides clinical management information on assessment and management of arthritis (including osteoarthritis) and [Hunter Integrated Pain Service \(HIPS\)](#) provides information and resources for people living with pain.

Victoria

Victorian Model of Care (MoC) for Osteoarthritis of the Knee and Hip [6] is a comprehensive system-level pathway of treatment for people with osteoarthritis of the knee and hip in Victoria. The Victorian MoC aims to provide best-practice management framework for hip and knee osteoarthritis and serves as a platform for

development and improvement of accessible, efficient and effective, and coordinated services for Victorian consumers.

[Osteoarthritis Hip and Knee Service](#) (OAHKS) coordinates the management of patients with hip and knee osteoarthritis, including helping to manage patients on waiting lists for specialist clinics and elective surgery.

GLA:D (<https://gladaustralia.com.au>) is an education and exercise program developed by researchers in Denmark for people with hip or knee osteoarthritis symptoms. It runs training courses for physiotherapists, which are currently being offered in Adelaide, and Brisbane. Melbourne courses are being planned.

[Better Health Channel](#) is part of the Digital Strategy and Services Unit in the Victorian Government's [Department of Health and Human Services](#), providing consumer-facing online health and medical information to help people understand and manage their health and medical conditions. It covers a wide range of health topics such as “Bones, muscles and joints”, “Pain” and “disability”.

[Musculoskeletal Australia](#) provides information, education and support services on diagnosis and treatment of arthritis, back pain, osteoporosis, musculoskeletal conditions and pain management due to these conditions. Regular webinars and seminars are held. MSK Help Line (phone 1800 263 265 and email helpline@msk.org.au) provide information on arthritis and musculoskeletal conditions, ways to live well with these conditions and how to manage pain.

[Victorian Active Ageing Partnership](#) (VAAP) is a three-year project started in October 2015, aiming to encourage participation in physical activity for older Victorians. VAAP provides a self-assessment tool and resources (SaTR) to assist consumers review and reflect on their current programs and activities. It provides professional development resource on various strategies to engage under-represented groups of older adults in physical activity, especially in areas of socio-economic disadvantage and among isolated, lonely older people. The project is being led by MOVE muscle, bone & joint health, in collaboration with Fitness Australia and Monash University.

[Specialist Clinics Programs](#) in Victorian Public Hospitals provide an interface between primary care services and acute inpatient services for people who need the focus of an acute setting to ensure the best outcomes.

Queensland

Nambour General Hospital and Sunshine Coast University Hospital offer Orthopaedic Physiotherapy Screening Clinic and Multidisciplinary Service. This program ran from July 2014 to December 2016 and improved patient access - doubled orthopaedic outpatient throughput with low re-referral rates (4%); reduced long wait across all urgency categories; increased surgical conversion rates for new appointments; and improved clinician, GP and consumer satisfaction.

Queensland Health is developing Clinical Prioritisation Criteria for its clinics, including orthopaedics and general medicine which cover arthritis and musculoskeletal conditions. The first phase included orthopaedics. Criteria for persistent pain are currently under development.

Western Australia

The Elective Joint Replacement Service Model of Care in Western Australia [199] was developed to encourage best practice and optimise patient outcomes in joint replacement service with a focus on sustainable quality and safety within the public health system using a patient-centred focus approach.

The **Primary Health Network (PHN)'s Needs Assessment** is developed to support WA Primary Health Alliance (WAPHA) in identifying and analysing health and service needs within the Country WA, Perth North and Perth South PHN regions to prioritise activity to address those needs. [PainHealth](#) website for easing musculoskeletal

pain provides clinically supported information on how to manage musculoskeletal pain. The [HealthPathways WA](#) website contains condition specific pathways to assist in assessing, managing and referring patients.

Community Pain Education Programs are delivered by three service providers in the Perth North and Perth South PHN regions. The Community Pain Education Program is an evidence-based treatment and support program for people with chronic pain. The Community Pain Education Program service providers commenced using the electronic Persistent Pain Outcomes Collaborative (ePPOC) tool from 1 April 2017, which aims to help improve services and outcomes for patients suffering from chronic pain through benchmarking of care and treatment. In the 12-month period since service providers commenced using ePPOC, 10-37% reported arthritis/degenerative as a chronic condition [200].

Integrated Chronic Disease Care activities are delivered across Country WA PHN to provide a collaborative, wrap around model of care for people who have chronic conditions, with a focus on providing clinical care and supporting individuals and families to self-manage their conditions, including osteoarthritis.

Musculoskeletal Rehabilitation Group for the Aged was trialled in Country WA PHN's Midwest region to support older people with lower limb osteoarthritis, chronic pain, those with elevated fall risk and those awaiting lower limb orthopaedic surgery. The project was delivered over a six-week period; patients received exercise and education to reduce falls incidents and allowed for individual and group-based sessions. Treatment included group-based hydrotherapy, gym-based exercise and education sessions.

A trial of working together in different ways project, delivered in Country WA PHN's South West region, was designed to support patients impacted by pain living in more remote regional areas. The project supported the development of collaboration between GPs, allied health providers and non-medical services for improved access to holistic and multi-disciplinary care addressing chronic conditions and enduring pain. The project outcome was improved self-management skills of complex patients with enduring pain.

Naïve Inquiry Study led by WAPHA in collaboration with Curtin University School of Public Health, the Royal Australian College of General Practice and WA General Practice Education and Training and the Health Consumers' Council (WA) involved research projects during 2016 (part 1)-2017 (part 2) as part of the larger process of developing new models of Primary Care in WA. The Naïve Inquiry approach aims to explore a range of stakeholder views and experiences and consumer perspectives on chronic condition management within primary care. Naïve Inquiry Part 3 will encompass interviewing Allied Health professionals and WAPHA to provide ongoing support for people with chronic conditions (including osteoarthritis) through GP Care Plans.

Tasmania

Arthritis and Osteoporosis Tasmania: the evidence-based "Take Charge of Pain Program" is designed to assist people who have lived with pain for more than three months and are motivated to learn how they can start to take steps to manage their pain more confidently. Arthritis Tasmania also has a training module for exercise physiologists and fitness trainers; a community speakers program; and provides educational seminars for consumers and healthcare professionals.

Rural Primary Health: Services for musculoskeletal conditions are provided as part of the rural primary health contracts who have three providers across Tasmania. These services deliver a variety of service models (individual and group sessions) in their specified regions.

ITC Program: The program offers Care Coordination for Aboriginal people with Chronic Conditions, including musculoskeletal conditions, who require multidisciplinary care.

Outpatient Services: Allied Health professionals provide a significant proportion of outpatient activity for patients with musculoskeletal and joint issues. Outpatient services are provided in the 4 acute hospitals as well as a number of Community Health and or Rural Inpatient Facilities as Outreach services. Services range

from physiotherapy led services such as the NW Early Intervention Service, the [RHH-COAP](#), NW-Prehab (pre-surgical preparation), hydrotherapy, and single discipline outpatient services.

Private Rheumatology Services: Private rheumatology practices receive referrals state-wide. There is limited access to private service in the north/northwest requiring patients to attend private services in the south.

Key gaps in services include limited public services, with no services available in the north and north-west of the State. Extensive waiting lists exist for available public musculoskeletal services in Hobart, including:

- 6 months for urgent rheumatology cases and nearly 3 years for non-urgent cases;
- 20 months for the osteoarthritis conservation management service
- 20 months for orthopaedic clinics
- 1–2 years for hip or knee replacement surgery (on top of the wait for the orthopaedic clinic).

South Australia

The OAKS study: The Queen Elizabeth Hospital are evaluating the role of statins and zoledronic acid in osteoarthritis. See <https://www.hospitalresearch.com.au/research/areas/arthritis/>

The Independent Living Centre has occupational therapists who can help people with arthritis by providing advice on equipment that assists with activities of daily living. See https://dhs.sa.gov.au/_data/assets/word_doc/0006/46536/arthritis-management.doc for further information.

Gap in the services: there are currently 3,157 people on the orthopaedics waiting list (as at 9/7/2018) and 216 of these are overdue on the list.

Services for special populations

Rural and remote populations

Access to appropriate services, particularly public funded allied health services remain an issue for people with osteoarthritis who require specialist services as most of these services are located in metropolitan areas [201]. Utilising outreach and telehealth services for specialist consultations is proposed as one of the Strategies to provide services for rural and remote population. Such services may also be useful for allied health service provision [201].

The ARA provides [guidance](#) on telehealth, which can support patients in rural and regional areas. The Rural Outreach Project, sponsored by Janssen-Cilag Pty Ltd, aims to encourage metropolitan-based rheumatologists to provide medical education to patients and healthcare professionals living outside of cities.

The Rural and Remote Clinical Support Unit (RRCSU) provides support services to Torres and Cape, Central West, North West and South West Hospital and Health Services. The unit supports safe and quality rural and remote healthcare through the production of clinical resources, training, credentialing, medical advisory support and primary healthcare information system services.

Aboriginal and Torres Strait Islander Populations

After adjusting for age difference, in 2004–2005 Aboriginal and Torres Strait Islander peoples are 1.2 times as likely as non-Indigenous people to have arthritis [202]. In 2012, rates of hip and knee replacements were 288 per 100,000 in the non-Aboriginal population and 176 per 100,000 in the Aboriginal population [203]. In 2016–17 a higher proportion of Aboriginal and Torres Strait Islander people waited more than a year for elective surgery compared to other Australians (2.0% vs 1.7%) [204].

Awareness-raising campaigns and strategies

[Move it in May](#) is an awareness-raising campaign that aims to get people moving and raise money for people living with arthritis. Funds raised go to Arthritis Australia, along with the state-based organisations.

Capacity building programs

A short National Osteoarthritis Strategy Environmental Scan Survey was conducted to investigate the clinical and research capacity for osteoarthritis in Australia and explore the different resources in terms of workforce and research in the field of osteoarthritis prevention and treatment. Understanding the capacity and resources will inform National Osteoarthritis Strategy and other related health policy to minimise the burden of osteoarthritis to the community.

In total, 47 respondents from 7 states/territories completed the survey, with NSW representing 45%. The majority of the respondents' main musculoskeletal area of focus is osteoarthritis. The survey revealed that both clinicians and researchers only have limited time for clinical practice and research: clinicians spend on average 50% of their time in clinical practice, with 41% of the patients that they see are being treated for osteoarthritis) and researchers spend on average 40% of their time in research. Most of the survey respondents are in the early stage of their research career (1–10 years). Capacity building programs are needed to enhance the clinical and research capacity for osteoarthritis in Australia. Currently, there are a number of capacity building programs offering education and support program for healthcare professionals, such as:

- Twelve-pain [Better Pain Management](#) education modules for health professionals, offered by Faculty of Pain Medicine ANZCA.
- Australia and New Zealand Musculoskeletal Clinical Trials Network (ANZMUSC, <http://anzmusc.org>) is an NHMRC Centre of Research Excellence, whose vision is to optimise musculoskeletal health through high-quality, collaborative clinical research. ANZMUSC was formed in 2015 and includes researchers from across Australia.
- Centre for Research Excellence in Total Joint Replacement Optimising oUtcomes, equity, cost-effectiveness and patient Selection (OPUS).
- The Institute of Bone and Joint Research (IBJR) is an Institute devoted to advancing our understanding of the disorders and diseases of the musculoskeletal system, their diagnosis and treatments. IBJR consists of 5 different units that carry out extensive research in the musculoskeletal field, including Basic Research Groups (Murray Maxwell Biomechanics Laboratory, Raymond Purves Bone And Joint Research Laboratories and Sutton Arthritis Research Laboratory) and Clinical Research Departments (Department of Rheumatology and Department of Orthopaedics). It aims to advance research in diseases of the musculoskeletal system and bring the latest evidence-based information back to the community.
- [Australian Institute for Musculoskeletal Science \(AIMSS\)](#): AIMSS is a collaboration between The University of Melbourne, Victoria University and Western Health, which focuses on performing high-quality, multi-disciplinary and translational research on ageing and musculoskeletal diseases.
- Grant funding opportunities: Arthritis Australia provides [grant funding](#) for projects.

F. Stakeholder List

Arthritis ACT	Australian Primary Health Care Nurses Association
Arthritis Australia	Australian Private Hospitals Association
Arthritis NSW	Australian Psychological Society
Arthritis Queensland	Australian Rehabilitation Providers Association
Arthritis SA	Australian Rheumatology Association
Arthritis Tasmania	Australian Self Medication Industry Association (ASMI)
Arthritis Victoria	Australian Society of Rehabilitation Counsellors (ASORC)
Arthritis WA	Bupa Australia
Australasian College of Acupuncture and Chinese Medicine (AACMA)	Business Council of Australia
Australasian College of Sports of Exercise Medicine Physicians	Carers Australia
Australasian Faculty of Musculoskeletal Medicine	CHF
Australasian Integrative Medicine Association	Chiropractors Association of Australia
Australian College of Nursing	Chronic Illness Alliance
Australian and New Zealand College of Anaesthetists - Faculty of Pain Medicine	Chronic Pain Australia
Australian and New Zealand Society for Geriatric Medicine	Complementary Medicines Australia
Australian Association for Exercise and Sports Science (AAESS)	Concord Clinical School
Australian Association of Gerontology	Consumer organisations
Australian Association of Musculoskeletal Medicine	Consumers Health Forum of Australia
Australian Association of Social Workers	Dean of the Faculty of Pain Medicine
Australian Chamber of Commerce and Industry	Department of Health - Australian Federal Government
Australian College of Environmental and Nutritional Medicine	Department of Health - NT
Australian College of Nurse Practitioners	Department of Health - QLD
Australian College of Rural and Remote Medicine (ACRRM)	Department of Health - SA
Australian Commission on Safety and Quality in HealthCare	Department of Health - TAS
Australian Council of Trade Unions	Department of Health - VIC
Australian Government (Comcare)	Department of Health - WA
Australian Healthcare and Hospitals Association	Department of Health (TGA)
Australian Indigenous Doctors Association	Department of Health and Ageing
Australian Industry Group	Department of Veterans Affairs
Australian Medical Acupuncture College	Dietitians Association of Australia
Australian Medical Association	Dietitians Association of Australia
Australian Orthopaedic Association	Exercise and Sports Science Australia
Australian Pain Management Association	Exercise and Sports Science Australia
Australian Pain Society	HBF Health Fund Ltd
Australian Pain Society: Pain Interest Group-Nursing Issues	HCF Insurance (Hospitals Contribution Fund of Australia Ltd)
Australian Physiotherapy Association	Health Insurance Restricted Membership Association of Australia (HIRMAA)
Australian Physiotherapy Association	Healthways Australia Pty Ltd
Australian Podiatry Association NSW/ACT	Hospitals across Australia
	Macquarie University
	MBS Review
	Medibank Health Solution
	Medical Technology Association of Australia
	Medicare Review

Ministry of Health - NSW
 MOVE muscle, bone & joint health
 Musculoskeletal Australia
 National Aboriginal Community Controlled Health Organisation
 National Disability Insurance Agency
 National Health and Medical Research Council (NHMRC)
 National Institute of Complementary Medicine
 National Prescribing Service, NPS Medicinewise
 National Rural Health Alliance
 Neuro Orthopaedic Institute Australasia
 NIB Health Funds
 NSW Agency for Clinical Innovation
 Musculoskeletal Network
 NSW Agency for Clinical Innovation Pain Network
 NSW Multicultural Health Communication Service
 Occupational Therapy Australia
 Occupational Therapy Australia
 Osteopathy Australia
 Pain Australia and Chair of MBS review
 Pain Management Research Institute, Northern Clinical School, University of Sydney
 Painaustralia
 painHEALTH, Clinical Research School of Physiotherapy and Exercise Science, Curtin University
 Pharmaceutical Society of Australia
 Pharmaceutical Society of Australia
 Pharmacy Guild of Australia
 Prima Health Solutions

Primary Health Networks (PHN) - Australian Department
 Primary Health Networks (PHN) - State and Territory operators
 Rheumatology Health Professionals Association
 Royal Australasian College of Occupational Medicine
 Royal Australasian College of Physicians
 Royal Australasian College of Physicians - Faculty of Occupational and Environmental Medicine
 Royal Australasian College of Physicians - Faculty of Rehabilitation Medicine
 Royal Australasian College of Surgeons
 Royal Australian and New Zealand College of Radiologists
 Royal Australian College of General Practitioners
 Royal Australian College of Nursing
 Rural Doctors Association
 Sports Medicine Australia
 Transport Accident Commission Victoria
 Universities across Australia
 WorkCover - ACT
 WorkCover - NSW
 WorkCover - SA
 WorkCover - WA
 Workers' Compensation Regulatory Authority - QLD
 Workplace Health and Safety - QLD
 Workplace Standards - TAS
 WorkSafe - NT
 WorkSafe - VIC, TAS

G. Members of the National Osteoarthritis Strategy Project Group

The Osteoarthritis Leadership Group

Prof. David Hunter (Chair)	Florance and Cope Chair of Rheumatology, Chair of Institute of Bone and Joint Research, Northern Clinical School, University of Sydney and Royal North Shore Hospital
Ms. Franca Marine	National Policy and Government Relations Manager, Arthritis Australia
Ms. Katharine Silk	Integration and Innovation Manager of the Australian Healthcare and Hospitals Association
Dr. Norman Swan	Broadcaster and presenter of the ABC Radio's <i>Health Report</i> ; Executive Director Tonic Health Media
Ms. Sonia Dixon	Head of Better Health Foundation, Medibank Private
Prof. Lyn March	Liggins Professor of Rheumatology and Musculoskeletal Epidemiology, Northern Clinical School, University of Sydney; the Australian Rheumatology Association representative
Prof. David Lloyd (Working Group chair)	Director, Gold Coast Orthopaedics Research, Engineering and Education, Griffith University
Prof. Kim Bennell (Working Group chair)	Director of Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne
Prof. Peter Choong (Working Group chair)	Sir Hugh Devine Chair of Surgery, Head of Department of Surgery, St. Vincent's Hospital, University of Melbourne
Ms. Lesley Brydon	Founding CEO, PainAustralia (Retired); independent consumer representative
Dr. Yingyu Feng	Project Manager, University of Sydney

The Osteoarthritis Working Groups

Prevention Working Group	
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Prof. Andrew Hills	Associate Dean Global College of Health and Medicine, Professor of Sports and Exercise Science, University of Tasmania
Dr. Chris Vertullo	Director of Orthopaedic Surgery and Sports Medicine Centre; Director Knee Research Australia
Prof. Kay Crossley	Director of La Trobe Sport and Exercise Medicine Research Centre, La Trobe University
Dr. Hugh Seward	Sport and Exercise Physician, Newtown Medical Centre
Prof. Wendy Brown	School of Human Movement and Nutrition Sciences, Faculty of Health and Behavioural Sciences, University of Queensland
Prof. Anna Peters	Head of Obesity and Population Health in the School of Health and Social Development, Deakin University
Dr. Lauren Fortington	Senior Research Fellow, Federation University Australia
Dr. Helen Keen	Clinical Rheumatologist and Senior Lecturer University of Western Australia
Ms. Yarie Nikolic	Consumer representative
Mr. Luciano Melo	Coordinator of the prevention working group, physiotherapist, senior research coordinator, University of Sydney

Living Well with Osteoarthritis Working Group	
Prof. Kim Bennell (chair)	Director of Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne
Prof. Andrew Briggs	Professor of Health Systems and Services Research, Curtin University; Lead, Victorian Model of Care for Osteoarthritis of the Hip and Knee
Dr. Dan Ewald	General Practitioner, Lennox Head Medical Centre
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A/Prof. Jane Fitzpatrick	Specialist Sports and Exercise Physician, University of Melbourne
Prof. Michael Nicholas	Director of Pain Education and Pain Management Program; Co-chair of Pain Management Network, University of Sydney
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Prof. Sarah McNaughton	NHMRC Career Development Fellow, Institute for Physical Activity and Nutrition, Deakin University
Prof. Flavia Cicuttini	Head of Musculoskeletal Unit, School of Public Health and Preventive Medicine, Monash University
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Ms. Jillian Eyles	Coordinator of the living well with Osteoarthritis working group, physiotherapist, senior research coordinator, University of Sydney

Advanced Care Working Group

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Prof. Ian Harris	Professor of Orthopaedic Surgery, South Western Sydney Clinical School, University of New South Wales
Dr. Bill Donnelly	Specialist hip and knee replacement surgeon; Adjunct Professor of School of Chemistry, Physics, Mechanical Engineering, Queensland University of Technology
Prof. Philip Clark	Chair of Health Economics, School of Population and Global Health, University of Melbourne
Prof. Peter O'Sullivan	Specialist Musculoskeletal Physiotherapist, Curtin University
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Mr. Matt Jennings	Director Allied Health of Liverpool Hospital; Associate Director Physiotherapy at South Western Sydney Local Health District
Dr. Kim Watkins	Lecturer, School of Pharmacy and Biomedical Sciences, Curtin University
Prof. Elizabeth Geelhoed	Professor of Health Economics, School of Allied Health, the University of Western Australia
Dr. Kevin Cheng	Founder of Osana Care, General Practitioner
Prof. Lennert Veerman	Professor of Public Health and Designing Healthy Communities Theme Leader, School of Medicine, Griffith University Gold Coast
Dr. Kean- Seng Lim	General Practitioner, Mt Druitt Medical Centre
Mr. Marcus Dripps	Physiotherapist, CEO of Corio Bay Health Group
Mr. Kane Bradford	Associate Director of Australian Sports Commission
Dr. Penny Carlson	School Engagement and Partnerships, Australian Sports Commission
Dr. David Hughes	Chief Medical Officer, Australian Institute of Sport
Dr. Simon Towler	Clinical Lead, South Metropolitan Health Service Futures Program
Mr. Krister Partel	Advocacy Director for the Australian Healthcare and Hospitals Association
Mr. David Menzies	Manager Chronic Disease Programs, South Eastern Melbourne Primary Health Network
Dr. Tim Ho	Rehabilitation and pain specialist
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Mr. Rhys Jones	Pharmacy Guild of Australia
Ms. Karen Filocamo	Consumer Representative

The Osteoarthritis Project Team

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Dr. Xia Wang	Coordinator of the advanced disease working group, post-doctoral research fellow of musculoskeletal health, University of Sydney

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