

# **Quality of physiotherapy care for people with hip and/or knee osteoarthritis**

Pek Ling Teo (Samantha)  
ORCID ID: 0000-0003-1657-1820

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Faculty of Medicine, Dentistry and Health Sciences  
Department of Physiotherapy  
The University of Melbourne

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## **Abstract**

Patients with hip and/or knee osteoarthritis (OA) desire high quality of care when managing their condition. Clinical guidelines advocate exercise, weight loss (for people who are overweight or have obesity), and education regarding self-management as first line treatments for OA. Physiotherapists are important providers of such non-surgical interventions. As such, they have a professional responsibility to ensure that the care they provide to people with OA is safe and aligns with best practice. Current quality indicators (QIs) for care of people with hip and knee OA are not designed to specifically assess physiotherapy care. Furthermore, little is known about the experiences of Australian physiotherapists and people delivering and receiving care for knee OA, and if their reported experiences align with the national Clinical Care Standard for knee OA (quality statements that describe the care Australian patients should be offered by health professionals and health services for OA in line with current best evidence). This thesis aims to build on the current understanding of the quality of care provided by physiotherapists to people with hip and/or knee OA, by developing QIs to evaluate such care and exploring the experiences of physiotherapists and patients delivering and receiving care for knee OA in Australia.

Study One aimed to identify and prioritize the most important clinical guideline recommendations relevant to physiotherapy practice for hip and/or knee OA. A panel of 62 international physiotherapists was invited to first complete an online modified-Delphi survey, followed by a priority-ranking exercise. Recommendations were extracted from two high quality international clinical guidelines for OA. From an initial list of 70 potential recommendations (including seven new recommendations generated by the expert panel), 30 were included in the priority-ranking exercise. The final 30 recommendations were condensed and categorised by content area to convey high quality physiotherapy management for hip and/or knee OA. The top recommendations related to providing exercise, weight management, and education as core treatments; individualised OA management; and communication approaches.

Study Two aimed to develop a patient-reported QI tool (the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool) and to

assess its reliability and validity. A conceptual model based on the final 30 recommendations from Study One was used when developing the QUIPA tool, where the four main categories of the final recommendations were synthesized to establish the three subscales of the QUIPA tool. Patient focus groups were conducted to further refine the draft items. To evaluate test-retest reliability, construct validity (hypothesis testing) and criterion validity, patients with hip and/or knee OA (n= 65) were recruited to attend a single physiotherapy session and required to complete the QUIPA tool one, twelve- and thirteen-weeks following their session. Physiotherapists (n= 9) were expected to complete the tool immediately post-consultation. Patient test-retest reliability was assessed between twelve- and thirteen-weeks following their session. Construct validity was evaluated based on three predefined hypotheses. Criterion validity was assessed based on agreement between physiotherapists and participants at week one. The final QUIPA tool comprised 18 items (three subscales). The QUIPA tool demonstrated acceptable test-retest reliability for subscales and total score, but individual items showed inadequate reliability. Construct validity was adequate but criterion validity for individual items, subscales and the total score was poor. The QUIPA tool needs further refinement to improve its clinimetric properties before implementation into clinical practice.

Study Three was a qualitative study that explored the experiences of Australian physiotherapists (n= 22, thirteen from major cities, five from inner regional, three from outer regional and one from remote areas) delivering care for people with knee OA and investigated the degree to which their reported experiences aligned with the Australian OA of the Knee Clinical Care Standard. Inductive thematic analysis was conducted, and the interview data were also deductively analysed according to the national Clinical Care Standard. Findings revealed that physiotherapists tended to focus on a biomedically-oriented assessment with little evaluation of psychosocial factors that may impact patients with knee OA. They perceived their primary role as providing goal-focused individualised exercise via short-term episodic care. Knee surgery was considered as a last option but for patients who chose surgery, physiotherapists ‘prepped’ them for the procedure. Patient comorbidity, poor patient adherence and patient desire for a ‘quick fix’ were perceived as clinical challenges. Physiotherapists also described a mismatch between what they know and what they do when it came to

manual therapy, imaging, and weight loss advice. They saw weight management, medication, and surgical advice as outside of physiotherapy scope of practice. Overall, physiotherapists' reported experiences with delivering care for people with knee OA were mostly consistent with the OA of the Knee Clinical Care Standard.

Study Four was a qualitative study that explored the experiences of Australians (n= 24, from all six states and two territories of Australia) receiving physiotherapy care for knee OA. Participants generally presented to physiotherapists with a pre-existing OA diagnosis and were mostly comfortable with their existing knowledge about OA. They described accessing physiotherapy through various referral pathways, funding models and modes of delivery. They consulted physiotherapists for various reasons but most commonly for assistance with knee pain and functional impairments. Participants described physiotherapy management as primarily centred on exercise therapy, often supplemented by adjunctive treatments. Participants perceived advice about surgery, medications, and injections as outside of physiotherapists' domain of care. Participants were generally happy and satisfied with their physiotherapy experiences and described valuing the personalised care they received. They also believed surgery was inevitable for their knee OA. Overall, these results provide evidence from the patients' perspectives about the important role physiotherapists play in the care of Australians with knee OA.

Findings from this thesis build on the current understanding of the quality of care provided by physiotherapists to people with hip and/or knee OA. The first two studies lay the groundwork for future design and evaluation of an international patient-reported QI tool for benchmarking quality of physiotherapy care in hip and/or knee OA. Overall, findings from the last two studies indicated that physiotherapy management of knee OA in Australia mostly aligned with the national clinical care standard and that patients were generally happy and satisfied with the physiotherapy care received. Suggested areas to improve care delivered by physiotherapists include increased consideration of psychosocial factors that may influence OA symptoms and prognosis, attention to the language used when discussing OA (i.e. avoid biomedical terms such as 'wear and tear' or 'degenerative') so that physiotherapists are not contributing to patient misinformation (i.e. joint surgery is inevitable; OA is a 'degenerative' or 'wear and

tear' condition; imaging is required to diagnose OA), increased emphasis on advice and information about losing weight (for patients who need it), pain medications and knee surgery, and offering regular longer-term reviews. Findings also highlight the importance of appropriate funding mechanisms to support Australians to access physiotherapy care for their knee OA both in private and public sectors.

## **Declaration**

This is to certify that:

- (i) This thesis comprises only my original work towards the Doctor of Philosophy;
- (ii) Due acknowledgement has been made in the text to all other material used;
- (iii) This thesis is less than 100,000 words length, exclusive of tables, references, and appendices.

Pek Ling Teo (Samantha)

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## **Preface**

Author contributions for submitted and published manuscripts (Chapters Three, Four, Five, Six) are outlined in the preface to each relevant chapter. The PhD candidate collated all data included in this thesis, completed statistical/qualitative analysis, and wrote the first draft of each manuscript submitted to journals for peer-review. The candidate was supported by a PhD stipend from the Australian Government Research Training Program Scholarship. All studies included in this thesis were supported by funding from the National Health and Medical Research Council Centre of Research Excellence (#1079078).

## Papers, publications, poster presentations

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**Teo PL**, Hinman RS, Egerton T, Dziedzic KS, Kasza J, Bennell KL: Patient-reported quality indicators to evaluate physiotherapy care for hip and/or knee osteoarthritis-development and evaluation of the QUIPA tool. *BMC Musculoskeletal Disorders*. 2020, 21(202). DOI: <https://doi.org/10.1186/s12891-020-03221-5> [Chapter Four]

**Teo PL**, Bennell KL, Lawford BJ, Egerton T, Dziedzic KS, Hinman RS: Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study. *Journal of Physiotherapy*. 2020, 66: 256-265. DOI: <https://doi.org/10.1016/j.jphys.2020.09.005> [Chapter Five]

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**Teo PL**, Hinman RS, Egerton T, Dziedzic KS, Kasza J, Bennell KL: Patient-reported quality indicators to evaluate physiotherapy care for hip and/or knee osteoarthritis-development and evaluation of the QUIPA tool. *University of Melbourne School of Health Sciences Research Higher Degree Student Colloquium*. Melbourne, Australia. October 2019.

## **Glossary of Abbreviations**

|        |                                                   |
|--------|---------------------------------------------------|
| AAOS   | American Academy of Orthopaedic Surgeons          |
| ABS    | Australian Bureau of Statistics                   |
| ACOVE  | Assessing Care of Vulnerable Elders               |
| ACSM   | American College of Sports Medicine               |
| ACR    | American College of Rheumatology                  |
| ASU    | Avocado soybean unsaponifiables                   |
| BEACH  | The Bettering the Evaluation and Care of Health   |
| CI     | Confidence interval                               |
| COX-2  | Cyclo-oxygenase-2                                 |
| EULAR  | European League against Rheumatism                |
| FGF    | Fibroblast growth factor                          |
| GLA:D  | Good Life with Osteoarthritis Denmark             |
| IA     | Intra-articular                                   |
| ICC    | Intraclass correlation coefficient                |
| IL-1   | Interleukin-1                                     |
| MIC    | Minimal important change                          |
| MSM    | Methylsulfonylmethane                             |
| MTP    | Metatarsophalangeal                               |
| NGF    | Nerve growth factor                               |
| NICE   | National Institute for Health and Care Excellence |
| NRS    | Numerical rating scale                            |
| NSAIDs | Non-steroidal anti-inflammatory drugs             |
| OA     | Osteoarthritis                                    |
| OARSI  | Osteoarthritis Research Society International     |
| PABAK  | Prevalence-adjusted bias-adjusted Kappa           |

|       |                                                                                |
|-------|--------------------------------------------------------------------------------|
| PPI   | Proton pump inhibitor                                                          |
| PRP   | Platelet rich plasma                                                           |
| QI    | Quality indicator                                                              |
| QUIPA | Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis |
| RACGP | Royal Australian College of General Practitioners                              |
| RCTs  | Randomised controlled trials                                                   |
| SD    | Standard deviation                                                             |
| SDC   | Smallest detectable change                                                     |
| TENS  | Transcutaneous electrical nerve stimulation                                    |
| TNF   | Tumour necrosis factor                                                         |
| T1    | Two weeks before                                                               |
| T2    | Immediately before                                                             |
| T3    | Immediately after                                                              |
| T4    | Three months after                                                             |
| UK    | United Kingdom                                                                 |
| USA   | United States of America                                                       |
| WOMAC | Western Ontario and McMaster Universities Osteoarthritis Index                 |
| YLDs  | Years lived with disability                                                    |

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## **Chapter One: Introduction and overview of chapters**

Hip and knee osteoarthritis (OA) are highly prevalent and remain as a leading cause of pain and disability worldwide. Clinical guidelines advocate exercise, weight loss (for people who are overweight or have obesity) and education regarding self-management as first line treatments for OA. Given the central role of conservative strategies for managing OA, physiotherapists are well placed to be providers of such care. As such, they have a professional responsibility to ensure that the care they provide to people with OA is safe and aligns with best practice.

There is evidence that the provision of clinical guideline recommendations for the management of OA is suboptimal in Australia and internationally. However, limited research has investigated the quality of physiotherapy care specifically for people with hip and/or knee OA and whether the care aligns with guideline recommendations. Moreover, little is known about methods to appropriately assess and measure quality of physiotherapy care for this patient population. It is important to thoroughly explore the quality of care provided by physiotherapists to people with hip and/or knee OA to identify gaps in practice and to shed light on the reasons for the gaps and barriers to optimal practice. This will help in the planning of strategies to support delivery of effective treatments and optimize treatment outcomes for patients.

This thesis will explore the quality of physiotherapy care for people with hip and/or knee OA through four studies. It will first identify the most important clinical guideline recommendations relevant to physiotherapy practice in the management of hip and/or knee OA. Based on the final list of prioritised recommendations, quality indicators (QIs) will be developed into a survey tool, followed by the testing of the tool's clinimetric properties prior to dissemination in clinical settings. This thesis will also qualitatively explore physiotherapists' and patients' experiences with delivering and receiving care for knee OA and investigate the degree to which their reported experiences align with the OA of the Knee Clinical Care Standard, developed and advocated by the Australian Commission on Safety and Quality in Health Care.

Findings from this thesis will lay the groundwork for future refinement of physiotherapy specific QIs for hip and/or knee OA. Findings will also inform service providers about the current quality of physiotherapy care for this patient population, as well as help identify and understand gaps in clinical practice to improve future care and service delivery by physiotherapists. Findings can also be used as a basis for developing physiotherapist educational/training interventions and to contribute to future quality improvement activities within the physiotherapy field in Australia to ensure that patients receive high quality care in managing their conditions.

**Chapter One** presents an introduction to the topic and an overview of the thesis.

**Chapter Two** presents a review of the literature relevant to the topics of this thesis. This includes the problems and management of hip and/or knee OA, quality of care and development of QIs particularly for OA care, the development and testing of QIs specifically for physiotherapy management of people with hip and/or knee OA, care of OA, barriers to delivering and engaging with high-quality OA care, Australian Clinical Care Standard for knee OA, as well as quality of physiotherapy care for people with hip and/or knee OA from physiotherapists' and patients' perspectives. For the purpose of this thesis, the term 'treatment' throughout is defined as a specific therapy to address the physical aspect of a condition. The terms 'care' and 'management' are used interchangeably, and they are collective terms to describe a number of treatments that considers the physical, mental, and social aspects of a person. This chapter concludes with an outline of the aims of the thesis.

**Chapter Three** outlines the study that aimed to determine the most important clinical guideline recommendations relevant to physiotherapy practice for hip and/or knee OA (Study One). International physiotherapists were invited to identify and prioritise recommendations from two high quality international clinical guidelines for OA via an online modified-Delphi survey, followed by a priority-ranking exercise.

**Chapter Four** details the development of a patient-reported QI tool for physiotherapy management of hip and knee OA and the testing of the tool's clinimetric properties (Study Two). A conceptual model based on the final list of clinical guideline

recommendations from Study One was used to develop the QUIPA tool. The draft QUIPA tool was further refined using patient focus groups to ensure it is expressed in lay language. The tool was then evaluated for its test-retest reliability, construct validity (hypothesis testing) and criterion validity. This was done by recruiting 65 people with hip and/or knee OA to attend a single physiotherapy consultation and completing the QUIPA tool one, twelve- and thirteen-weeks after their session. Physiotherapists (n=9) were expected to complete the tool immediately post-consultation. Patient test-retest reliability was assessed between twelve- and thirteen-weeks following their session. Construct validity was assessed using three predefined hypotheses and criterion validity was evaluated based on agreement between physiotherapists and participants at week one.

**Chapter Five** describes a qualitative study that explored the experiences of Australian physiotherapists delivering care for people with knee OA and investigated the degree to which their reported experiences align with the OA of the Knee Clinical Care Standard. Semi-structured individual telephone interviews were conducted with 22 physiotherapists, exploring their experiences in assessing, diagnosing, and providing treatment and reviews to people with knee OA, along with the barriers they typically faced when providing such care.

**Chapter Six** describes a qualitative study that explored the experiences of Australian people who had recently (prior six months) received physiotherapy care for their knee OA. Semi-structured individual telephone interviews were conducted with 24 people recruited from all over Australia, exploring if the care they received aligned with the OA of the Knee Clinical Care Standard. The aspects of care covered included assessment, diagnosis, treatment options and follow-up appointments for people with knee OA.

**Chapter Seven** summarises the main findings of the four studies included in this thesis and the implications of these findings for physiotherapy practice in the management of hip and/or knee OA. This chapter also summarises the strengths and limitations of the research and provides directions for future research.

**Table 1.1 Thesis structure and outline**

| <b>Chapter</b> | <b>Content</b>                                                                                                                                                                                     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>One</b>     | Introduction and overview                                                                                                                                                                          |
| <b>Two</b>     | Literature review, aims and key research questions                                                                                                                                                 |
| <b>Three</b>   | Study One: Identifying and prioritizing clinical guideline recommendations most relevant to physiotherapy practice for hip and/or knee osteoarthritis                                              |
| <b>Four</b>    | Study Two: Patient-reported quality indicators to evaluate physiotherapy care for hip and/or knee osteoarthritis - development and evaluation of the QUIPA tool                                    |
| <b>Five</b>    | Study Three: Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study |
| <b>Six</b>     | Study Four: Patient experiences with physiotherapy for knee osteoarthritis in Australia - a qualitative study                                                                                      |
| <b>Seven</b>   | Conclusions, implications, and future directions                                                                                                                                                   |

## **Chapter Two Literature Review**

### **2.1 Osteoarthritis**

Osteoarthritis (OA) is the most common form of arthritis and remains a leading cause of joint pain and disability worldwide (Arthritis Foundation, 2017; Murphy et al., 2010). The hip and knee are the most commonly affected lower limb joints and are major contributors to the burden of OA (Cross et al., 2014). This section outlines OA definition and symptoms, diagnosis, prevalence, and incidence, as well as the personal and socioeconomic burden of the condition.

#### **2.1.1 Osteoarthritis definition**

Osteoarthritis is a clinical syndrome of joint pain, with varying degree of functional limitation and impaired quality of life (NICE, 2014). The condition involves changes in the articular cartilage, subchondral bone, ligaments, capsule, synovial membrane and periarticular muscles (Brandt et al., 2006). Osteoarthritis Research Society International (OARSI) (Kraus et al., 2015) defines OA as “a disorder involving movable joints characterized by cell stress and extracellular matrix degradation initiated by micro- and macro-injury that activates maladaptive repair responses including pro-inflammatory pathways of innate immunity. The disease manifests first as a molecular derangement (abnormal joint tissue metabolism) followed by anatomic, and/or physiologic derangements (characterized by cartilage degradation, bone remodeling, osteophyte formation, joint inflammation and loss of normal joint function), that can culminate in illness.” (p.1237). Osteoarthritis is often inappropriately described as a ‘wear-and-tear’ disease however, it is not merely a passive degenerative disease of cartilage but a whole-joint disease due to an imbalance between joint tissues breakdown and repair (Fu et al., 2017). People with OA may experience pain, reduced function and physical limitations to their daily activities (NICE, 2014). Of these symptoms, pain is the most dominant and a main driver of clinical decision-making and health service utilisation (Fu et al., 2017).

#### **2.1.2 Pain experience in osteoarthritis**

According to the International Association for the Study of Pain, pain is defined as “an unpleasant sensory and emotional experience associated with or resembling that

associated with, actual or potential tissue damage.” (International Association for the Study of Pain, 2020). The ‘pain’ definition has recently been expanded to include six additional pain notes (International Association for the Study of Pain, 2020), as illustrated in Figure 2.1.



**Figure 2.1 Revised definition of six pain notes by the International Association for the Study of Pain in 2020. Taken from the International Association for the Study of Pain website (2020).**

Pain is a complex subjective phenomenon, and its perception can differ from one individual to another. Pain generally acts as a protective/warning role by alerting individuals of danger to avoid injury or rest to allow healing. However, when the warning role ceases, maladaptive pain occurs, which is described as constant and ongoing pain (e.g., chronic). A typical pain condition usually has an underlying injury that heals or resolves. However, OA is a disease that does not resolve, thus, people with this condition often have chronic pain (Neogi, 2013).

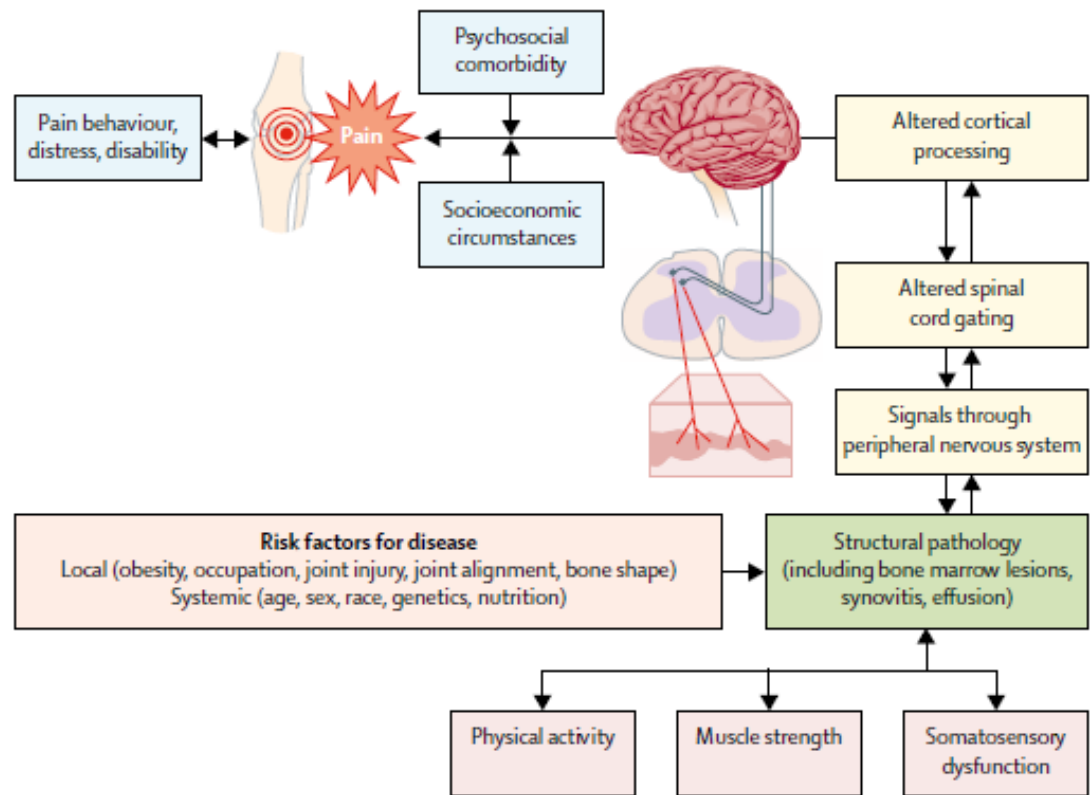
People with OA can experience two distinct types of chronic pain: one that is intermittent but severe, and another that is a more constant background pain or aching (Carlesso et al., 2020). People in the early stages of OA typically experience predictable episodes of pain that are triggered by an activity, whereas in the middle stages of OA, people tend to experience more constant pain, particularly at night. In advanced stages

of OA, people often have more constant pain with episodes of unpredictable pain (Fu et al., 2017; Neogi, 2013). Sources of OA pain are not well-understood but may result from multiple interactive pathways that are best described using a biopsychosocial model, which recognises the influence of biological, psychological, and social factors in generating the experience of OA pain (Figure 2.2) (Trouvin et al., 2018).

From a biological perspective, neuronal activity in nociceptive pathways causes signal generation leading to exacerbation of joint pain. Tissue (joint) inflammation causes chemical mediators to be released into the joint, which sensitize primary afferent nerves such that normal non-painful stimulus (such as walking) may trigger a painful response (Neogi et al., 2009). Over time, this increased neuronal activity in the peripheral nervous system (peripheral sensitization) can cause plasticity changes in the central nervous system (central sensitization) (Woolf et al., 2000). Central sensitization can intensify pain sensation and elicit pain responses in other parts of the body distant from the inflamed joint, which is commonly known as ‘referred pain’ (Fingleton et al., 2015; Woolf, 2011).

Apart from biological consideration, multiple psychosocial factors such as mood, personality traits, self-efficacy, coping styles, socioeconomic status (education, income), and social support can further influence the pain experience (Bartley et al., 2017). Such factors help explain the variability in pain occurrence and severity amongst people with OA, especially when there is a discordance between radiographic changes and reporting of joint pain (Hannan et al., 2000). For instance, chronic pain can often cause mental distress, anxiety, and pain catastrophizing, all of which are associated with poorer physical function in people with OA (Scopaz et al., 2009). Similarly, those with lower self-efficacy are at risk of experiencing higher pain and worse physical outcomes (Wright et al., 2008). There is also evidence to suggest that socioeconomic disadvantage such as lower educational level and income status can result in more pain and disability amongst people with OA (Cleveland et al., 2013). In terms of social support, higher levels of perceived social support have been found to be related to better life satisfaction and improved depressive symptoms amongst people with OA (Cleveland et al., 2013). Collectively, it is important to consider the influence of biopsychosocial factors on the pain experience when devising treatment strategies for

people with OA to ensure that the multidimensional pain presentation in OA is successfully addressed and treated.



**Figure 2.2 Experience of osteoarthritis pain based on the biopsychosocial model. Taken from Hunter and Bierma-Zeinstra (2019).**

### 2.1.3 Osteoarthritis diagnosis

Osteoarthritis is commonly diagnosed based on clinical symptoms, physical examination and/or radiographic findings (R. Altman et al., 1991; R. Altman et al., 1986; Guermazi et al., 2013). Main clinical symptoms include pain, stiffness, functional limitations, crepitus, joint instability, buckling or ‘giving way’ sensation, deformity, swelling, muscle weakness, fatigue, and pain-related psychological distress (Hunter et al., 2008; Peat et al., 2001). Features of physical examination that suggest an OA diagnosis include crepitus, limited range of movement, pain with passive range of movement, tenderness over the joint line, bony enlargement in superficial joints, gait

deformity, joint instability, muscle weakness, and joint swelling (R. Altman et al., 1991; R. Altman et al., 1986; Hunter et al., 2008).

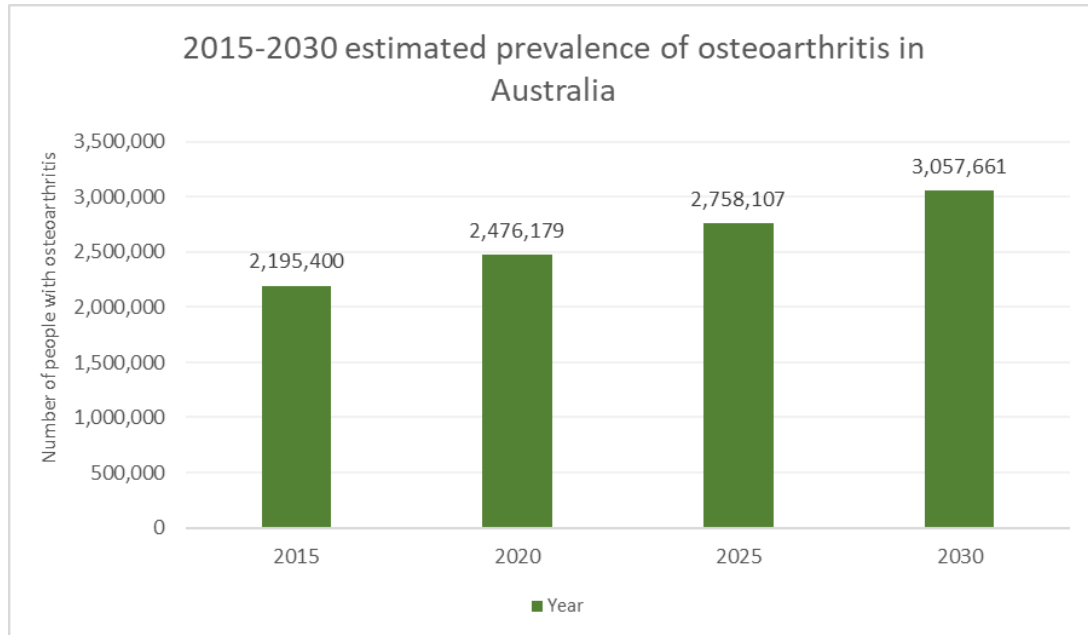
The Kellgren- Lawrence scale (Kellgren et al., 1957) is the most commonly used criterion for radiographic classification of OA (Dagenais et al., 2009). It is a five-point numeric grading system (0= no structural changes, 4= severe structural changes) to evaluate radiographic OA. Features on which these grades are based include osteophyte formation on the joint margins, periarticular ossicles (related to distal and proximal interphalangeal joints), narrowing of joint cartilage associated with subchondral sclerosis, small pseudocystic areas with sclerotic walls around the subchondral bone, and altered shape of the bone ends (particularly the head of the femur) (Kellgren et al., 1957).

Nonetheless, evidence suggests that agreement between radiographic and clinical examination of OA is often inconsistent (Bedson et al., 2008; Kinds et al., 2011). For instance, amongst people who have pain in one knee, radiographic features of knee OA are evident in 50% of the painful knees and 36% of the non-painful knees (Javaid et al., 2012). Therefore, contemporary clinical guidelines advocate that imaging is not needed to diagnose OA and instead, diagnosis should be based on clinical presentation (Cibulka et al., 2017; NICE, 2014). The National Institute for Health and Care Excellence (NICE) OA guidelines recommend OA be diagnosed clinically without investigations if an individual is 45 years or over, experiences activity-related joint pain, and either has joint morning stiffness that lasts no longer than 30 minutes or no morning stiffness (NICE, 2014). Thus, the NICE clinical criteria are used to select participants for studies within this thesis.

#### **2.1.4 Prevalence and incidence**

Osteoarthritis is highly prevalent, affecting 303 million people worldwide in 2017 (James et al., 2018). In Australia, it is estimated that 9.3% of the Australian population (2.2 million Australians) have self-reported OA (Australian Bureau of Statistics, 2019). Based on the national prevalence of OA data from the Australian Bureau of Statistics (ABS) 2014-2015 National Health Survey, a population-level analysis study projected that the number of Australians with self-reported OA will increase to almost 3.1 million in 2030 (Ackerman et al., 2018) (Figure 2.3). The global age-standardized prevalence

estimates for symptomatic and radiographic OA in 2017 were 3754.2 per 100 000 population, which was an increase of 9.3% since 1990 (Safiri et al., 2020).



**Figure 2.3 Estimated prevalence of osteoarthritis in Australia from 2015-2030. Taken from Ackerman, Pratt, Gorelik and Liew (2011).**

The prevalence estimates of OA vary depending on the definition of OA used (such as radiographic, symptomatic, or self-report) and characteristics of the study population (such as age, gender or country of origin) (Pereira et al., 2011). A systematic review in 2011 showed that overall, there is a higher prevalence for radiographic OA than for symptomatic or self-report OA. However, not all individuals with radiological OA have clinical symptoms, or vice versa. Irrespective of the OA definition used, the hand joints have the highest overall OA prevalence, followed by the knee and hip joints. Knee OA is more prevalent in women than in men and there are no sex differences in hip OA (Pereira et al., 2011) (Table 2.1). The prevalence of OA also increases with age (Felson et al., 1987), with higher prevalence in both men and women from 45 years old onwards, and further increases in women of older age (March et al., 1998; van Saase et al., 1989). The lifetime risk of developing symptomatic knee OA amongst people aged 25 years or above in the United States (US) has been estimated at 13.8%. The lifetime

risk of symptomatic knee OA is significantly greater amongst people who have obesity (19.7%) compared to those with normal weight (10.9%), and is also higher in women (16.3%) compared to men (11.4%) (Losina et al., 2013). For symptomatic hip OA, one in four people from age 45 years is estimated to develop this condition in their lifetime (Murphy et al., 2010). Hip deformities such as CAM deformity and acetabular dysplasia increase the risk of hip OA by approximately two fold especially amongst people aged 55 years or older (Saber Hosnijeh et al., 2017).

**Table 2.1 Overall prevalence (95% Confidence Intervals) of knee and hip osteoarthritis by sex and joint site. Taken from Pereira et al., (2011).**

| <b>Joint</b>       | <b>Osteoarthritis prevalence</b> | <b>Osteoarthritis prevalence</b> | <b>Total osteoarthritis prevalence (95% CI)</b> |
|--------------------|----------------------------------|----------------------------------|-------------------------------------------------|
|                    | <b>in women (95% CI)</b>         | <b>in men (95% CI)</b>           |                                                 |
| <b><i>Knee</i></b> | 27.3% (26.9-27.7)                | 21.0% (20.5-21.5)                | 23.9% (23.6-24.2)                               |
| <b><i>Hip</i></b>  | 11.6% (11.1-12.1)                | 11.5% (11.0-12.1)                | 10.9% (10.6-11.2)                               |

Globally, OA accounts for approximately 14.9 million incident cases in 2017, an increase of 8.2% since 1990 (Safiri et al., 2020). However, there is limited research on the incidence estimates for hip and knee OA in the worldwide population. Nationally, United Kingdom (UK) population-based health care data between 2000-2010 showed that the annual general practice consultation incidence of newly diagnosed OA (at any joint) amongst people aged 15 years or above was 8.6/1000 consultations, and specifically, 6.3/1000 consultations amongst men and 10.8/1000 consultations amongst women. The incidence increased sharply in individuals aged 45 years old onwards, peaking at older ages ( $\geq 75$  years). The annual incidence of newly diagnosed knee and hip OA was 3.5/1000 and 1.4/1000 consultations respectively (Yu et al., 2015). These findings were lower compared to the 2006-2010 population-based health care data from Spain, which showed that the annual incidence of newly diagnosed knee and hip OA was 6.5/1000 and 2.1/1000 consultations respectively (Prieto-Alhambra et al., 2014). In Australia, the annual rate of OA managed by general practitioners was 2.6/100 encounters in the year 2015-2016, and it remains as one of the top ten conditions most

frequently referred to a medical specialist (Britt et al., 2016). Given the high prevalence and incidence of hip and knee OA, it is important that treatments for these conditions are high quality and align with best evidence.

#### ***2.1.5 Personal and socioeconomic burden***

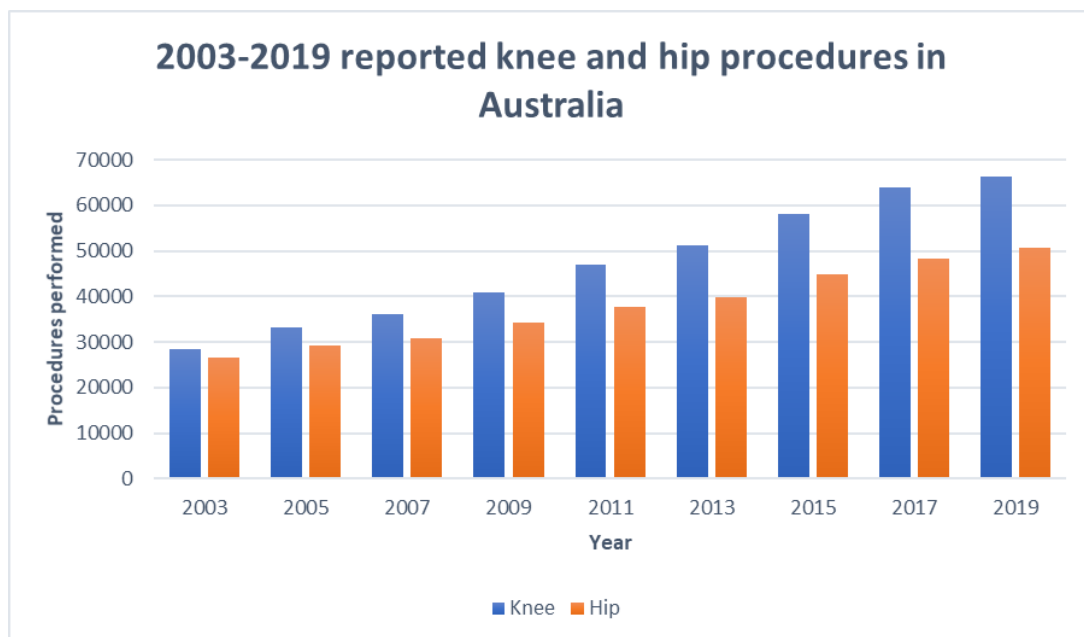
Osteoarthritis is the leading cause of pain and disability in the ageing population (March et al., 2004) and its impact on individuals can be significant. Globally, it accounted for approximately 9.6 million years lived with disability (YLDs) in 2017, which was an increase of 9.6% since 1990 (Safiri et al., 2020). The burden of OA is expected to rise due to the projected increase in prevalence related to population growth, ageing of the population, and increasing population weight, which will put increasing pressure on the health care system to deliver high quality evidence-based care.

##### ***Personal impact***

People living with OA often experience pain and disability, limiting their participation in social and recreational activities. People with OA often struggle to perform their daily activities such as walking, negotiating steps, or driving and some may rely heavily on their family and friends to assist with daily tasks. In Australia, 58% of people with OA have ‘moderate’ to ‘very severe’ pain, and almost half of them describe pain interfering with their work ‘moderately’ or ‘extremely’ (Australian Institute of Health and Welfare, 2019). Osteoarthritis-related pain is associated with poorer sleep, fatigue, lower mood and loss of independence (Hawker, 2019). Psychological issues, such as anxiety and/or depression are also highly prevalent amongst people with OA and are associated with more pain, frequent hospital visits, increased medication intake and poorer quality of life (Sharma et al., 2016). In Australia, approximately one in five people with OA have high or very high psychological distress (Australian Institute of Health and Welfare, 2019). In addition, people with OA often have co-morbidities such as cardiovascular disease, back pain and metabolic syndrome and the presence of these chronic conditions increases their likelihood of poorer physical function (Swain et al., 2020). People with OA were also twice as likely to describe their health as ‘poor’ than those without OA (Australian Institute of Health and Welfare, 2019).

*Socioeconomic impact*

In Australia, the overall cost of OA to the economy is approximately \$22 billion annually (Arthritis Australia, 2011, 2014). The hip and knee joints are the major contributors to the burden of OA, often leading to joint replacement surgery (Cross et al., 2014). Although joint replacement is indicated for people who are significantly affected by OA and fail to respond to both pharmacological and non-pharmacological interventions, the increasing demand for the procedure imposes a huge cost to the healthcare system. Since 2003, the annual rates of knee and hip total joint replacement in Australia have increased by 156% and 125% respectively, and more than 56,000 primary total knee replacements and 39,000 primary total hip replacements were performed in 2018 (Australian Orthopaedic Association National Joint Replacement Registry, 2019). Figure 2.4 shows the reported knee and hip procedures in Australia based on the Australian Orthopaedic Association National Joint Replacement Registry, from 2003-2019.



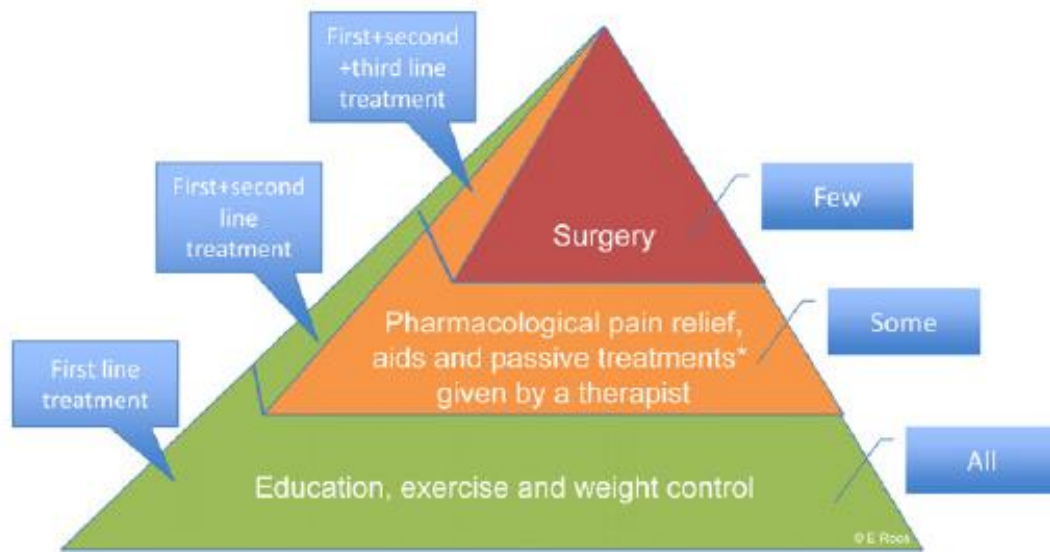
**Figure 2.4 Reported knee and hip procedures in Australia from 2003-2019. Taken from the Australian Orthopaedic Association National Joint Replacement Registry (2019).**

In 2015, the direct health costs (in-hospital costs, out-of-hospital medical costs, and prescription medication costs) for OA in Australia were estimated to be more than \$2.1 billion, which equates to \$970 in health care costs for every person with the condition. The cost estimates are expected to exceed \$2.9 billion by the year 2030 (Ackerman et al., 2018).

The indirect costs (including loss of incomes, productivity, superannuation and/or taxation revenue, carer costs, extra welfare payments, cost of aids and home modifications, travel costs) of OA are expected to be greater than the direct cost, and are mostly attributed to loss of productivity (Arthritis Australia, 2007; D. Schofield et al., 2016). In 2009, the estimated cost of arthritis (including OA and other rheumatic diseases) through lost labour force participation amongst Australians aged 45-64 years comprised a loss of income of approximately AU\$3.8 million, extra welfare payments of AU\$291 million, and lost taxation revenue of AU\$394 million (D. Schofield et al., 2016; D. J. Schofield et al., 2013). By 2030, approximately 59,000 people are projected to be out of the labour force due to arthritis, which is a 13% increase over 15 years (D. Schofield et al., 2016). Therefore, cost-effective treatments for the management of OA are fundamental to minimize the economic impact of the condition.

## **2.2 Management of hip and knee osteoarthritis**

Current treatments for OA focus around alleviating pain and managing symptoms to improve function and delay/prevent the need for joint replacement surgery. Due to the chronic nature of OA, patients should be provided with care that is continuous, individualised according to their needs and goals, and patient-centred (NICE, 2014). Shared decision-making between patients and health professionals is important, taking into consideration patient's preferences and values (Brand et al., 2013). Given the broad impact of OA on the individual, a holistic approach to management is also necessary to ensure that both biological and psychosocial factors are considered and effectively addressed if modifiable. Osteoarthritis is best managed by using a combination of non-pharmacological and pharmacological treatments, with surgery reserved for those with end-stage OA (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018) (Figure 2.5).



**Figure 2.5 The treatment pyramid for osteoarthritis. Taken from Roos and Juhl (2012).**

Many clinical guidelines for OA have been developed (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018), and are updated regularly, in an effort to support health care practitioners to provide evidence-based care to people with OA (Institute of Medicine Committee on Standards for Developing Trustworthy Clinical Practice Guidelines, 2011). The guidelines typically contain non-pharmacological, pharmacological, and/or surgical recommendations for OA care and are aimed at a variety of health care providers, including general practitioners, medical specialists, and allied health professionals. This section will outline the principles of OA management, describe the core OA treatments, and discuss the pharmacological, surgical, and adjunctive treatments for OA.

### **2.2.1 Principles of OA management**

#### *Patient-centred care*

Patient-centred care is an important element of holistic management for people with OA (NICE, 2014). The Institute of Medicine advocates patient-centred care as one of the six pillars to improve care (Institute of Medicine, 2001). It is defined as “providing care that is respectful of, and responsive to, individual patient preferences, needs and

values, and ensuring that patient values guide all clinical decisions” (p.40) (Institute of Medicine, 2001). Under this approach, care should be tailored to patients’ needs and values, and information should be readily available to patients and their families to allow informed decisions to be made. Patients can then be the source of control over their own health care decisions through effective communication and information sharing with their health professionals (Brand et al., 2013).

Under the eight principles of patient-centred care (Figure 2.6) as outlined by the Picker Institute (Picker Institute, 2013, 2020), patients should be recognised as an individual and be treated with dignity and respect. They should be kept abreast of their OA condition, be involved in any related decision-making process, and be well-informed and educated about their condition to promote autonomy and facilitate self-management. Patient-centred interaction helps to strengthen therapeutic alliance (Pinto et al., 2012) and improve patient satisfaction with care (Oliveira et al., 2012). Coordinated and integrated care is essential when considering multiple services and supports deemed appropriate for patients to minimize the sense of vulnerability, especially in those who may already feel helpless in dealing with OA. In addition, both physical comfort and emotional support may be required. Physical comfort involves managing patients’ pain and aiding them with their activities and daily living needs. Emotional support can be offered to patients to address any anxiety that may result from their OA diagnosis, the impact of the condition on themselves and family or any related financial burden because of OA disease. Furthermore, it is essential to acknowledge the involvement of an individual’s family and friends and to respect their role in decision-making. Finally, the transition process for patients who need ongoing OA treatment and services should also be coordinated, planned and easy to follow (Picker Institute, 2013).

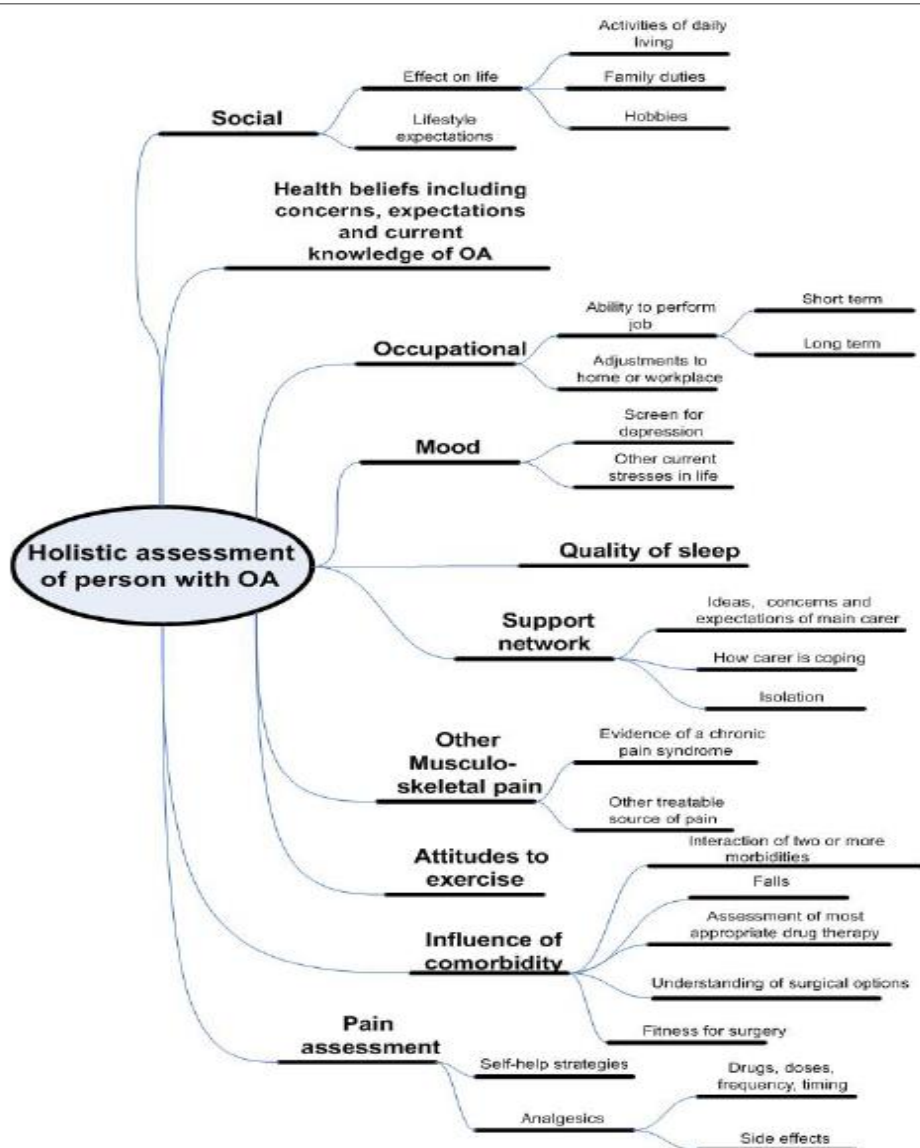


**Figure 2.6 The eight Picker principles of patient-centred care. Taken from the Picker Institute (2020).**

### *Biopsychosocial approach to OA management*

As illustrated in Section 2.1.2, the pain experience in OA is best described using a biopsychosocial model. This model has been widely accepted as the most effective approach to manage chronic pain (Moseley et al., 2015) and therefore should be used as a guiding principle in providing high quality management for OA. The biopsychosocial model was originally proposed by Engel as an approach to adequately understand and care for patients from the biomedical, psychological and social perspectives (Engel, 1977). These factors are interrelated in such a way that changes to one component may affect other components. For example, in the context of OA, a patient who has difficulty walking due to their knee pain and stiffness (biological factors) may become depressed and anxious (psychological factors), which in turn may affect their performance at work or home (social factors) (Keefe et al., 2002). Conversely, if a person has higher self-efficacy (psychological factors) to engage in doing knee exercises, this may reduce knee symptoms (biological factors) and may positively influence work and daily life (social factors).

Therefore, when formulating a management plan for people with OA, it is essential that a holistic approach that considers the individual's medical, psychological, and social needs is adopted in order to meet their needs and goals (Hunt et al., 2008). The effect of OA on individuals' function, quality of life, occupation, mood, relationships, and leisure activities should be appropriately evaluated and managed. Other factors for consideration include patients' OA knowledge, health beliefs, treatment expectations and the presence of comorbidities (Figure 2.7) (NICE, 2014).



**Figure 2.7 Holistic assessment of people with osteoarthritis. Taken from the National Clinical Guideline Centre (2014).**

Finally, clinicians need to be well-equipped with competent assessment and communication skills, along with adequate OA knowledge so that they fully comprehend the influence of OA on an individual's life to be able to provide patients with accurate OA assessment, explanation, and prognosis in ways that can be understood.

### **2.2.2 Core osteoarthritis treatments**

Conservative treatments such as exercise, weight loss (for people who are overweight or have obesity) and education regarding self-management are widely recommended as first line treatments for hip and/or knee OA (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018).

Exercise is advocated for all patients, regardless of age, structural disease severity, comorbidity, pain severity or disability (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018). Exercise has been supported by high-quality evidence showing it decreases pain and improves function amongst people with hip and knee OA (Fransen et al., 2015; Fransen et al., 2014; Goh et al., 2019; Moseng et al., 2017). A recent 2019 systematic review and meta-analysis of 77 randomised controlled trials (RCTs) (n= 6472) evaluating efficacy of exercise-only interventions for hip and knee OA showed moderate treatment benefits for pain reduction (effect size 0.56, 95% CI 0.44 to 0.68), along with improvement in function (effect size 0.50, 95% CI 0.38 to 0.63) and physical performance (effect size 0.46, 95% CI 0.35 to 0.57) at or nearest to eight weeks, although the effect gradually reduced over time (Goh et al., 2019). It is difficult to determine the type of exercise that is the most effective because studies that were included in this systematic review comprised all exercise types.

A 2015 Cochrane review of 44 RCTs (n= 3537) of land-based therapeutic exercise for knee OA indicated moderate treatment effect for pain immediately post-treatment (standardised mean difference (SMD) 0.49, 95% confidence interval (CI) 0.39 to 0.59), which was equivalent to a reduction of twelve points (95% CI 10 to 15 points) on a 0 to 100-point visual analogue scale (VAS) for pain (0= no pain) (Fransen et al., 2015). The effects of exercise were moderate for improvement in self-reported physical function immediately post-treatment (SMD 0.52, 95% CI 0.39 to 0.64), based on a

pooled data of 44 studies (n= 3913). This was equivalent to an improvement of ten points (95% CI 8 to 13 points) on a 0 to 100-point scale (Fransen et al., 2015).

The treatment effects of exercise on hip OA were smaller with less evidence available. A 2017 systematic review and meta-analysis of twelve RCTs (n= 1202) evaluating the effects of land-based exercise programs on people with symptomatic hip OA demonstrated a small treatment effect for pain reduction (SMD -0.24, 95% CI -0.42 to -0.06) and small to moderate effect in physical function improvement (SMD -0.34, 95% CI -0.50 to -0.18) compared with no exercise. The systematic review and meta-analysis also investigated the effects of exercise programs of varying compliance with the American College of Sports Medicine (ACSM) exercise dose recommendations (Garber et al., 2011), and demonstrated that the treatment effects on pain (SMD -0.42, 95% CI -0.58 to -0.26) and physical function (SMD -0.41, 95% CI -0.58 to -0.24) were higher in the 'high' compliance group compared with the 'uncertain' compliance group (Moseng et al., 2017). These treatment effects of exercise were similar to those achieved with non-steroidal anti-inflammatory drugs (NSAIDs) (Zeng et al., 2018), but with fewer adverse effects.

Most studies in both reviews involved muscle strengthening and general aerobic exercises (such as walking) with some studies focusing on Tai Chi (Fransen et al., 2015; Moseng et al., 2017) and these exercises are recommended by most clinical guidelines (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018). Exercise dosage, which included the frequency, intensity and duration of the exercise program varied considerably between the studies included in both reviews (Fransen et al., 2015; Moseng et al., 2017). Although the ACSM exercise dose recommendations for healthy adults (Garber et al., 2011) appear to be valid and relevant to people with OA (Moseng et al., 2017), no recommendations regarding optimal exercise dosage can be made.

The effect of weight loss interventions on pain reduction and physical function improvement has been demonstrated in people with knee OA (Hall et al., 2019) but not explored in people with hip OA. A 2018 systematic review and meta-analysis of 19 RCTs evaluating the effect of non-surgical non-pharmacological weight loss treatment (with or without exercise) on people with knee OA demonstrated a positive treatment

effect on pain when combining diet and exercise treatments (SMD -0.37, 95% CI -0.69 to -0.04) (Hall et al., 2019). Physical function also improved with either diet treatments (SMD -0.30, 95% CI -0.52 to -0.08) or combined diet and exercise treatments (SMD -0.32; 95% CI -0.56 to -0.08). The meta-analysis was based on pooled data of nine studies (Hall et al., 2019). Evidence also suggests that a 5% to 10% weight loss is sufficient to produce positive treatment effects on pain (effect size 0.33, 95% CI 0.17 to 0.48) and self-reported disability (effect size 0.42, 95% CI 0.25 to 0.59) in people with mild to moderate knee OA and mean body mass index of 33.6 - 36.4 kg/m<sup>2</sup>, although the effect size on physical function was small (effect size 0.23, 95% CI 0.06 to 0.40) (Chu et al., 2018). Furthermore, clinically important benefits continue to increase with greater weight loss, where weight loss of over 20% of body weight achieved the most pain reduction and physical function improvement compared with weight loss under 5% and over 5% of body weight (Messier et al., 2018).

Patient education is another core element of OA management and aims to provide information about OA disease, management principles and available treatment options (NICE, 2014). A study gauging the views of OA experts and patients reached consensus on key information topics that were important for patient education (French et al., 2015). The most important topics included disease knowledge (e.g. 'OA is not an inevitable part of getting older'), information on different treatment options (e.g. the importance of regular physical activity and individualised exercise programs, strategies to lose weight, and surgical options) and the limited value of diagnostic imaging (e.g. 'joint damage on X-ray does not indicate how much your OA will affect you').

Self-management programs are a common option to provide education for people with OA. However, a 2014 Cochrane review of 29 RCTs (n= 6753) found moderate quality evidence indicating that self-management programs were likely to provide no or small benefits (effect sizes 0.14-0.34) up to 21 months in cultivating self-management skills, reducing pain, and improving OA symptoms and physical function when compared to usual care (Kroon et al., 2014). Nevertheless, it is possible that peer-support within the self-management programs may enhance patient empowerment, improve decision-making, and minimise anxiety, all of which are outcomes that were not assessed in the

studies. The optimal design of an education program for people with OA is unclear (Chodosh et al., 2005).

### **2.2.3 Pharmacological treatments**

People with OA often experience joint-related pain, which can also impact their physical function. These are the most important issues for people with OA (Wluka et al., 2016), hence OA treatments predominantly focus on reduction of pain. Pharmacological pain relief treatments are indicated (Table 2.2) when non-pharmacological interventions do not achieve sufficient pain control.

The NICE OA guidelines recommend paracetamol and/or topical NSAIDs as the first-line pain relief in addition to core treatments, followed by oral NSAIDs, cyclooxygenase-2(COX-2) inhibitors or opioids (NICE, 2014). Similarly, the 2019 American College of Rheumatology (ACR) guidelines strongly recommend oral and topical NSAIDs for knee OA (Kolasinski et al., 2020). A 2017 systematic review and meta-analysis of 76 RCTs (n= 58451) did not find single-agent paracetamol to be clinically effective for the treatment of OA regardless of dose (da Costa, Reichenbach, et al., 2017). According to a 2018 systematic review and meta-analysis of 43 RCTs (n= 7900) and seven observational studies (n= 218074), topical NSAIDs demonstrated small to moderate effects on pain reduction (SMD -0.30, 95% CI -0.40 to -0.20) and functional improvement (SMD -0.35, 95% CI -0.45 to -0.24) in people with OA (Zeng et al., 2018). Topical NSAIDs were shown to be safe and effective for pain relief in OA with no serious gastrointestinal or renal adverse events observed in trials or in the general population (Zeng et al., 2018). A 2017 network meta-analysis of 73 RCTs found that oral NSAIDs were effective for hip and knee OA, in terms of reaching the minimum clinically important difference in pain and function (da Costa, Reichenbach, et al., 2017). However, due to concern about their safety (associated gastrointestinal and cardiovascular events), short-term use (as needed) of oral NSAIDs at the smallest dose possible is preferable (da Costa, Reichenbach, et al., 2017).

Intra-articular corticosteroid injections are recommended by the NICE OA guidelines as an adjunctive treatment to relieve moderate to severe pain in people with OA (NICE, 2014). The ACR OA guidelines strongly recommend its use in knee OA for short term pain relief (Kolasinski et al., 2020). While there is evidence to support this treatment

(A. E. Nelson et al., 2014; van Middelkoop et al., 2016), there is also evidence against its use. For example, one RCT study found that repeated intra-articular corticosteroids injections over two years in people with knee OA resulted in significantly greater cartilage volume loss compared with placebo treatment (McAlindon et al., 2017). Likewise, a 2015 Cochrane review concluded that the clinically important benefits of short term (one to six weeks) intra-articular corticosteroids in knee OA remained unclear (Jüni et al., 2015). Given the adverse effects of pharmacological treatments, it is important that they are considered only when non-pharmacological treatments are insufficient for pain control.

#### ***2.2.4 Surgical treatments***

Surgical treatments can be viable options for people with OA when both non-pharmacological and pharmacological treatments fail to adequately alleviate their joint pain and enable people to maintain physical function.

Knee arthroscopy is only indicated for those who have true mechanical knee locking as opposed to morning joint stiffness, ‘giving way’ or evidence of loose bodies on imaging (Australian Commission on Safety and Quality in Health Care, 2017; NICE, 2014). A systematic review and meta-analysis of nine RCTs (n= 1270) showed minimal benefits of knee arthroscopy for knee OA pain up to two years (effect size 0.14, 95% CI 0.03 to 0.26) with no significant benefit on physical function (effect size 0.09, 95% CI -0.05 to 0.24) compared with non-surgical treatments (including sham surgery) (Thorlund et al., 2015). Another systematic review of thirteen RCTs and twelve observational studies concluded that, for people with knee OA, knee arthroscopy provided very small pain reduction and functional improvement short term ( $\leq 3$  months) and very small or no pain reduction and functional improvement long term ( $\leq 2$  years) when compared with conservative management (Brignardello-Petersen et al., 2017). Knee arthroscopy is also associated with harm (including symptomatic deep venous thrombosis, pulmonary embolism, infection, and death) compared with non-surgical treatments for knee OA (Thorlund et al., 2015).

Joint replacement surgery is indicated for patients who experience persistent joint symptoms (such as intolerable joint pain, stiffness and reduced function), and reduced quality of life despite optimal conservative treatment, along with severe joint

radiographic damage (Dieppe et al., 2011; Dowsey et al., 2012, 2016; NICE, 2014). Prospective studies assessing the influence of pre-operative radiographic changes on joint replacement surgery found that patients with more severe radiographic hip or knee damage were mostly likely to achieve the greatest improvement in pain and function following their joint replacement surgery (Dowsey et al., 2012, 2016). Joint replacement surgery can be a cost-effective intervention to improve quality of life of people with end-stage hip and/or knee OA (H. Higashi et al., 2011; Kamaruzaman et al., 2017). One RCT in Denmark compared total knee replacement with non-surgical treatments in patients with moderate to severe knee OA. Based on the intention-to-treat analysis, they found that the total knee replacement group had greater improvement in pain and function after one year compared with the non-surgical treatment group. However, the total knee replacement group had a higher number of serious adverse events (such as deep vein thrombosis and knee stiffness requiring manipulation under anaesthetic) than the non-surgical treatment group, and 74% of the non-surgical treatment group did not undergo total knee replacement in the subsequent year (Skou et al., 2015). A two-year follow up was completed in a subsequent study (Skou et al., 2018), and findings showed that only one out of three patients with moderate to severe knee OA underwent total knee replacement surgery within two years following non-surgical treatment.

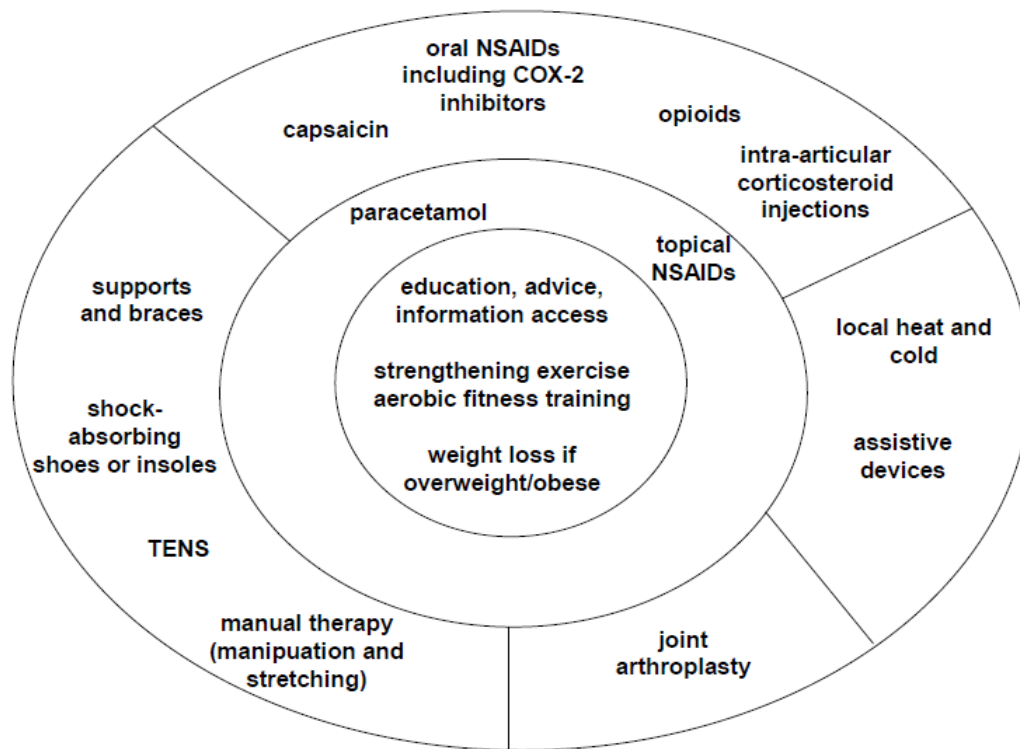
Joint replacement surgery has associated complications, which include those that are common with surgical procedures (e.g. bleeding, surgical site infection, venous thromboembolism) and those specific to the joint procedures (e.g. periprosthetic joint infection, periprosthetic fracture, aseptic loosening/instability) (El-Galaly et al., 2017; Hoskins et al., 2020; Mulcahy et al., 2013; Vajapey et al., 2020). A study of 121 hospital re-admissions (n= 105) following total knee replacement found that the most common reasons for re-admission were restricted range of motion (18.2%), wound complications (14%), surgical site infection (9.9%), and bleeding (9.9%) while venous thromboembolism was less common (3.3%). In addition, a systematic review of fourteen prospective studies found that 7-23% and 10-34% of patients who underwent hip (n= 13031) and knee (n= 12800) replacement respectively reported an unfavourable long-term pain outcome (Beswick et al., 2012).

Therefore, when referring people with OA for surgical opinion, they should be provided with appropriate information to help inform their decision and be offered timely joint conserving or replacement surgery when surgery is indicated and preferred (Australian Commission on Safety and Quality in Health Care, 2017; NICE, 2014). In addition, when discussing the possibility of joint surgery, information such as the benefits and risks of surgery, the potential consequences of not having surgery, recovery and rehabilitation post-surgery, the impact of prosthesis as well as the care pathways following surgery should be readily available to patients to allow them to make informed decisions (NICE, 2014).

### ***2.2.5 Adjunctive treatments***

Recommendations for other treatments for hip and knee OA can vary from one clinical guideline to another (Table 2.2). These treatments are ‘adjuncts’ to core treatments for OA (Figure 2.8). Specifically, treatment modalities such as the use of knee braces, shoe orthotics (e.g. heel wedges), acupuncture and intra-articular hyaluronans have conflicting evidence to support their effectiveness (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018), as reflected by varying recommendations across OA clinical guidelines (Table 2.2).

Varying recommendations from different guidelines are likely due to involvement of heterogeneous expert panels, availability of pharmacological treatments in different geographical locations, and variability of the studies included (Cutolo et al., 2015). Moreover, not all clinical guidelines are of high-quality, particularly in terms of rigour of development. The evidence to support or otherwise the most used adjunctive treatments for management of people with hip or knee OA are briefly discussed in this section, beginning with laterally wedged insoles and valgus knee bracing.



**Figure 2.8 Adjunctive treatments (outer rings) in relation to core treatments (middle circle) for osteoarthritis management. Taken from the National Clinical Guideline Centre (2014).**

A 2015 Cochrane review of thirteen moderate to low quality RCTs ( $n = 1356$ ) showed inconclusive evidence of the effectiveness of laterally wedged insoles in reducing pain and stiffness as well as improving function in people with early to severe knee OA (Duivenvoorden et al., 2015). The same review suggested that valgus bracing for medial compartment knee OA improved pain and function compared with no treatment, but the quality of the evidence was low (Duivenvoorden et al., 2015). Another systematic review evaluated the effects of valgus knee bracing in patients with medial knee OA and the meta-analysis of six RCTs ( $n = 445$ ) showed moderate benefits of valgus bracing for improvement in pain (SMD 0.56, 95% CI 0.03 to 1.09) and function (SMD 0.48, 95% CI 0.02 to 0.95) when compared with no knee bracing (Moyer et al., 2015). However, the wide confidence intervals indicate a high degree of uncertainty about the results. Further, treatment effect of valgus knee bracing, when compared with a control orthosis, was small for pain reduction (SMD 0.33, 95% CI 0.08 to 0.58) and

showed no effect for functional improvement (SMD 0.19, 95% CI -0.03 to 0.42) (Moyer et al., 2015).

Acupuncture is generally not recommended for the management of people with hip or knee OA (Bannuru et al., 2019; NICE, 2014; Royal Australian College of General Practitioners, 2018). A Cochrane review of six RCTs (n= 413) concluded that acupuncture had little or no effect in reducing pain or improving function compared with sham acupuncture in people with hip OA (Manheimer et al., 2018). Another systematic review investigated acupuncture effects on chronic pain conditions and its meta-analysis of nine RCTs showed small benefits of acupuncture for pain reduction (effect size 0.24, 95% CI 0.17 to 0.31) when compared with sham acupuncture in people with OA (Vickers et al., 2018).

Most clinical guidelines also do not support the use of intra-articular hyaluronan acid injections for OA (Bannuru et al., 2019; NICE, 2014; Royal Australian College of General Practitioners, 2018) as these injections did not show clinically important differences or benefits when compared with placebo (Jevsevar et al., 2015). Finally, glucosamine and chondroitin are not recommended for the management of hip or knee OA (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018) as there was limited high-quality evidence to support their efficacy compared with placebo (Singh et al., 2015; Zhu et al., 2018).

Given the wide-ranging non-pharmacological and pharmacological treatments for OA, effective management typically involves a variety of health care providers (such as general practitioners, medical specialists, and allied health professionals) and it is often unclear whose responsibility it is to enact individual guideline recommendations. Not all recommendations from OA guidelines would be within the scope of practice of most physiotherapists. It would help improve the usability of OA clinical practice guidelines for physiotherapists if the most important recommendations relevant to physiotherapy management of all people with hip and/or knee OA were identified and synthesised (Study One). The NICE (NICE, 2014) and EULAR (Fernandes et al., 2013) OA guidelines were selected as the two most suitable guidelines for this task at the time of study design as they scored highly on methodological quality based on the appraisal of

Guidelines Research and Evaluation II tool (Brosseau et al., 2014) and they were the only guidelines that covered both assessment and treatment for hip and knee OA.

**Table 2.2 Summary of the recommendations for/against a comprehensive range of adjunctive and pharmacological treatments for hip and/or knee OA from five high-quality clinical guidelines.**

|                                                         | NICE<br>2014       | ACR 2019                                                    | OARS 2019                                   | EULAR<br>2013             | RACGP 2018                                                                                           |
|---------------------------------------------------------|--------------------|-------------------------------------------------------------|---------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------|
| <b>Other non-pharmacological treatments</b>             |                    |                                                             |                                             |                           |                                                                                                      |
| Appropriate footwear                                    | ✓                  | Conditionally against (modified shoes)                      | ✗ (orthopedic)                              | ✓                         | -                                                                                                    |
| Assistive technology                                    | ✓                  | -                                                           | -                                           | ✓                         | -                                                                                                    |
| CBT                                                     | -                  | Conditionally for                                           | ✓                                           | -                         | Conditionally for                                                                                    |
| Cold therapy                                            | ✓                  | Conditionally for                                           | ✗                                           | -                         | Conditionally against                                                                                |
| Heat therapy                                            | ✓                  | Conditionally for                                           | ✗                                           | -                         | Conditionally for                                                                                    |
| Home/work adaptations                                   | ✓                  | -                                                           | -                                           | ✓                         | -                                                                                                    |
| Knee brace                                              | ✓                  | ✓ (K:tibiofemoral)<br>Conditionally for (K:patella-femoral) | ✗                                           | -                         | Conditionally neutral (varus unloading)<br>Conditionally against (valgus unloading & patellofemoral) |
| Manual therapy                                          | ✓ (H)              | Conditionally against                                       | ✗                                           | -                         | Conditionally for                                                                                    |
| Massage                                                 | -                  | Conditionally against                                       | ✗                                           | -                         | Conditionally for                                                                                    |
| Shoe orthotics                                          | ✓ (wedged/neutral) | Conditionally against (lateral & medial wedged insoles)     | ✗ (K: wedged insoles)                       | ✗ (Lateral-wedged insole) | Conditionally neutral (medial-wedged insole)<br>Conditionally against (Lateral-wedged insole)        |
| Taping                                                  | -                  | Conditionally for (K)                                       | ✗ (kinesio /patellar)                       | -                         | Conditionally neutral (patellar)<br>Conditionally against (kinesio)                                  |
| Vocational rehabilitation                               | -                  | -                                                           | -                                           | ✓                         | -                                                                                                    |
| Walking aids                                            | ✓                  | ✓                                                           | ✓ (except with widespread pain /depression) | ✓                         | Conditionally for                                                                                    |
| <b>Electrotherapy</b>                                   |                    |                                                             |                                             |                           |                                                                                                      |
| Pulsed electromagnetic/shortwave therapy                | -                  | -                                                           | ✗ (electromagnetic)                         | -                         | Conditionally neutral                                                                                |
| TENS                                                    | ✓                  | ✗                                                           | ✗                                           | -                         | Conditionally for                                                                                    |
| Other (eg shockwave, ultrasound, interferential, laser) | -                  | Conditionally against (K:pulsed vibration)                  | ✗                                           | -                         | Conditionally against                                                                                |
| <b>Pharmacological treatments</b>                       |                    |                                                             |                                             |                           |                                                                                                      |
| Anti-NGF                                                | -                  | -                                                           | -                                           | -                         | Conditionally against                                                                                |
| Bisphosphonates                                         | -                  | ✗                                                           | ✗                                           | -                         | Conditionally against                                                                                |
| Calcitonin                                              | -                  | -                                                           | ✗                                           | -                         | Conditionally against                                                                                |
| COX-2 inhibitors/PPI                                    | ✓                  | -                                                           | Conditionally for                           | -                         | Conditionally for                                                                                    |
| Colchicine                                              | -                  | Conditionally against                                       | ✗                                           | -                         | Conditionally against                                                                                |
| Diacerein                                               | -                  | -                                                           | ✗                                           | -                         | Conditionally against                                                                                |
| Doxycycline                                             | -                  | -                                                           | ✗                                           | -                         | ✗                                                                                                    |
| Duloxetine                                              | -                  | Conditionally for                                           | Conditionally for(K)                        | -                         | conditionally                                                                                        |
| FGF                                                     | -                  | -                                                           | -                                           | -                         | ✗                                                                                                    |
| Hydroxychloroquine                                      | -                  | ✗                                                           | -                                           | -                         | -                                                                                                    |
| IL-1 Receptor Antagonists                               | -                  | ✗                                                           | ✗                                           | -                         | -                                                                                                    |
| IL-1 inhibitors                                         | -                  | -                                                           | -                                           | -                         | ✗                                                                                                    |
| Methotrexate                                            | -                  | ✗                                                           | ✗                                           | -                         | Conditionally against                                                                                |
| Oral NSAIDs                                             | ✓                  | ✓                                                           | -                                           | -                         | Conditionally for                                                                                    |

|                                                  | NICE<br>2014 | ACR 2019                                | OARS 2019                | EULAR<br>2013 | RACGP 2018                                                   |
|--------------------------------------------------|--------------|-----------------------------------------|--------------------------|---------------|--------------------------------------------------------------|
| Opioids                                          | ✓            | Conditionally against<br>(non-tramadol) | ✗                        | -             | ✗                                                            |
| Paracetamol                                      | ✓            | Conditionally for                       | -                        | -             | Conditionally neutral                                        |
| Risedronate                                      | -            | -                                       | -                        | -             | -                                                            |
| Statins                                          | -            | -                                       | ✗                        | -             | -                                                            |
| Strontium<br>ranelate                            | -            | -                                       | ✗                        | -             | ✗                                                            |
| TNF Inhibitors                                   | -            | ✗                                       | ✗                        | -             | -                                                            |
| Topical NSAIDs                                   | ✓            | ✓(K)                                    | -                        | -             | Conditionally neutral                                        |
| Tramadol                                         | -            | Conditionally for                       | -                        | -             | -                                                            |
| <b>Intra-articular injections</b>                |              |                                         |                          |               |                                                              |
| Botulinum toxin                                  | -            | Conditionally against                   | -                        | -             | -                                                            |
| Corticosteroid                                   | ✓            | ✓                                       | Conditionally<br>for (K) | -             | Conditionally for                                            |
| Dextrose                                         | -            | Conditionally against                   | ✗                        | -             | Conditionally against                                        |
| prolotherapy                                     | -            | -                                       | ✗                        | -             | -                                                            |
| FX006                                            | -            | -                                       | ✗                        | -             | -                                                            |
| Hyaluronan                                       | ✗            | Conditionally against<br>(K)<br>✗ (H)   | Conditionally<br>for (K) | -             | ✗ (H)<br>Conditionally against<br>(K)                        |
| Nerve block<br>therapy                           | -            | -                                       | ✗                        | -             | -                                                            |
| PRP                                              | -            | ✗                                       | ✗                        | -             | Conditionally neutral                                        |
| Stem cell                                        | -            | ✗                                       | ✗                        | -             | ✗                                                            |
| <b>Nutraceuticals &amp; alternative medicine</b> |              |                                         |                          |               |                                                              |
| Acupuncture                                      | ✗            | Conditionally for                       | ✗ (electro/laser)        | -             | Conditionally against                                        |
| ASU                                              | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Balneotherapy                                    | -            | -                                       | ✗                        | -             | -                                                            |
| Boswellia serrata<br>extract                     | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Curcuma/curcumi<br>noid                          | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Capsaicin                                        | ✓            | Conditionally for (K)                   | ✗                        | -             | Conditionally neutral<br>(H)<br>Conditionally against<br>(K) |
| Chondroitin                                      | ✗            | ✗                                       | ✗                        | -             | Conditionally against                                        |
| Collagen                                         | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Fish oil                                         | -            | Conditionally against                   | -                        | -             | -                                                            |
| Glucosamine                                      | ✗            | ✗                                       | ✗                        | -             | Conditionally against                                        |
| MSM                                              | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Omega-3 fatty<br>acids                           | -            | -                                       | ✗                        | -             | Conditionally against                                        |
| Pine bark extract                                | -            | -                                       | ✗                        | -             | Conditionally neutral                                        |
| Rosehip                                          | -            | -                                       | -                        | -             | -                                                            |
| Rubefacients                                     | ✗            | -                                       | -                        | -             | -                                                            |
| Vitamin D                                        | -            | Conditionally against                   | ✗                        | -             | Conditionally against                                        |
| ✗ Not recommended                                |              |                                         |                          |               |                                                              |
| ✓ Recommended                                    |              |                                         |                          |               |                                                              |

ACR: American College of Rheumatology/Arthritis Foundation guideline for the management of osteoarthritis of the hand, hip, and knee (2019); ASU: Avocado soybean unsaponifiables; CBT: Cognitive behavioural therapy; COM: Co-morbidities; COX-2: Cyclooxygenase-2; EULAR: European League Against Rheumatism (2013); FGF: Fibroblast growth factor; H: Hip; IA: Intra-articular; IL-1: Interleukin-1; K: Knee; MSM: Methylsulfonylmethane; NICE: National Institute for Health and Care Excellence Osteoarthritis: care and management in adults guidelines; NSAIDs: Nonsteroidal anti-inflammatory drugs; NGF: Nerve growth factor; OARS: OA Research Society International guidelines for the non-surgical management of knee osteoarthritis (2019) PPI: Proton pump inhibitor; PRP: Platelet rich plasma; RACGP: Royal Australian College of General Practitioners guideline for the management of knee and hip osteoarthritis, second edition (2018); TENS: Transcutaneous electrical nerve stimulation; TNF: Tumour necrosis factor.

### **2.3 Quality of care**

In this fiscally constrained healthcare environment, there is a growing emphasis on quality over quantity-based care within the health system. In fact, providing high value and reducing low value care has become a priority for many health care systems due to the rising demand for health care services, cumulative healthcare costs, constrained resources and care gaps in clinical practice (Agency for Healthcare Research and Quality, 2018a; Australian Commission on Safety and Quality in Health Care, 2019). The ageing population, rise in prevalence of chronic diseases and the rapid development of health technologies impose further demands on health expenditure in many countries, amongst those being Australia (OECD, 2015). The rising burden of OA (Section 2.1.5) necessitates delivery of health services focussed on high-quality evidence-based care.

As healthcare costs continue to rise, there is mounting pressure for greater transparency and accountability from all healthcare providers to justify health spending. In addition, patients are shifting away from the traditional model of clinical care, where medical professionals are deemed to be the dominant clinical decision-makers and patients are passive recipients of care. Instead, consistent with a person-centred care approach as outlined in Section 2.2.1, patients now expect to be well-informed about their medical conditions and treatment options as well as to receive care services that are value for their money (Australian Commission on Safety and Quality in Healthcare, 2008; Marshall et al., 2002). Patients also desire collaborative partnerships with their health providers, such that patients and medical professionals make health decisions together and share expertise to achieve better patient outcomes (NICE, 2014; Royal Australian College of General Practitioners, 2018)

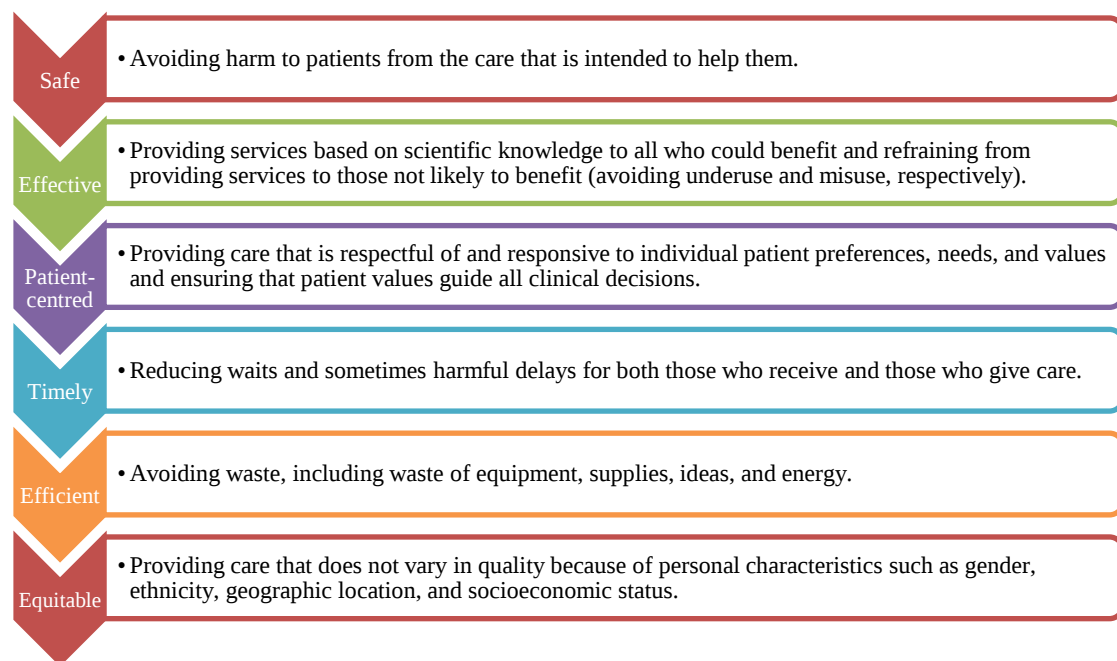
In order to meet the needs of health service funders, providers and patients, many countries have developed quality initiatives and improvement programs to coordinate quality and safety of health care. These include the USA (Agency for Healthcare Research and Quality, 2018a), Canada (Canadian Institute for Health Information, 2018), the UK (Care Quality Commission, 2018) and other European countries (European Commission, 2018; Westby et al., 2016). In 2006, the Australian Commission on Safety and Quality in Health Care was established by the Australian Federal Government. The Commission aims to help identify best clinical practice and

ensure optimal service delivery through collaboration with clinicians (Australian Commission on Safety and Quality in Health Care, 2012).

The following section will outline the definition of quality of care, discuss the rationale for quality assessment and the different types of healthcare quality measures, as well as explain how ‘quality indicators’ (QIs) can be used to evaluate quality of care.

### 2.3.1 Definition of quality of care

The World Health Organization defines quality of care as “the extent to which health care services provided to individuals and patient populations improve desired health outcomes. In order to achieve this, health care must be safe, effective, timely, efficient, equitable and people-centred” (World Health Organisation, 2019). Six domains of health care quality are advocated by the Institute of Medicine in the USA (Agency for Healthcare Research and Quality, 2018c) (Figure 2.9).



**Figure 2.9 The six domains of improving health care. Taken from Agency for Healthcare Research and Quality website (2018).**

In 2010, the Australian Commission on Safety and Quality in Health Care set a framework to achieve safe and high-quality care for all Australians, called the Australian Safety and Quality Framework for Health Care. This framework specifies

three core principles for safe and high-quality care, including providing care that is patient-centred, driven by information, and organised for safety (Australian Commission on Safety and Quality in Health Care, 2019). Patients should be able to access care easily when they need it and should be respected for their choices, needs and values. Building partnerships between patients, their family, carers, and healthcare providers ensures that affected individuals have positive experiences of health care. Care that is ‘driven by information’ implies evidence-based care and the need to collect and analyse safety and quality data for quality improvement. It also emphasizes strategies to improve patients’ experiences. The third core principle advocates for safety to be a central feature when running healthcare facilities, organising funding and for how staff should work. A quality framework makes it easier for patients to understand and value the overall concept of high-quality care and the meaning and relevance of quality measures so that they know what to expect when making health care choices (Hibbard et al., 2004).

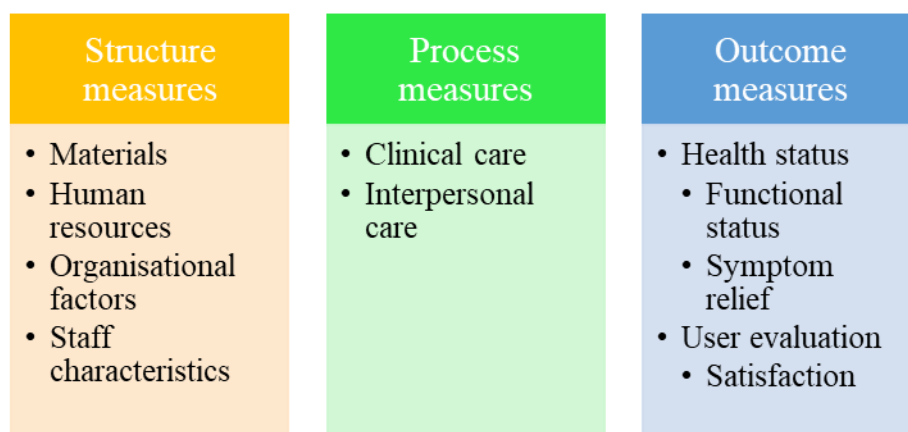
### ***2.3.2 Healthcare quality assessment***

Quality assessment and improvement are fundamental in enhancing accountability of health care professionals, for benchmarking health services, optimising effective care while minimising medical errors, and ultimately improving patient outcomes (S. M. Campbell et al., 2002; Mainz, 2003). The objectives of measuring quality of care are to ultimately reduce unnecessary or inappropriate care (i.e. reduce overuse), identify underutilisation of effective care, and appropriately detect any misuse of care. Overuse of care may include excessive or unnecessary use of imaging for diagnostic purposes or unwarranted surgical procedures. Such practices not only expose patients to potential side effects of the related procedures, they also do not contribute to the overall improvement of the patients and are a waste of resources (Flynn et al., 2011). An example of overused care is the rising rate of knee arthroscopy in the last decade particularly amongst the middle-aged group with knee OA (Bohensky et al., 2012; Kim et al., 2011; Thorlund et al., 2014) despite current clinical guidelines recommending against its use because it is ineffective for improving knee OA symptoms (American Academy of Orthopaedic Surgeons, 2013; NICE, 2014).

Underutilised care refers to clinicians failing to provide the necessary evidence-based care. For instance, an Australian study of 489,900 general practitioners' encounters at which OA was managed found that patients were most frequently referred for surgical opinions and prescribed with medications to address their OA issues. Core treatments such as exercise and weight loss advice/referral were less frequently provided by general practitioners (Brand et al., 2014). Misuse/poor care refers to clinicians providing inappropriate care. In the context of OA management, this may include clinicians providing information that reinforces fear-avoidance behaviours or one that fails to address the role of psychosocial factors in symptom severity and management. Therefore, it is important to identify ways to assess and improve quality of care within the health care systems to ensure that patients receive high quality care for their conditions and to optimise their treatment outcomes.

### 2.3.3 Types of healthcare quality measures

Quality of healthcare can be assessed and measured using structure, process, and outcome measures (Figure 2.10) (Donabedian, 1988).



**Figure 2.10 Three types of healthcare quality measures. Taken from Campbell et al. (2000).**

*Structure measures* - Structure is the setting in which the care is provided, and includes material, human resources, as well as organisational factors (Donabedian, 1988). Structural measures provide information about a health care provider's capacity,

systems, and processes to provide high-quality care. Examples include the use of electronic medical records/medication order entry systems within the health care settings, and the proportion of specialists or ratio of providers to patients (Agency for Healthcare Research and Quality, 2015).

*Process measures* - Process refers to the method by which the care is delivered and includes the provision of care by health care professionals as well as patients' effort in seeking care (Donabedian, 1988). Process measures generally reflect recommendations from clinical guidelines and can be used to inform patients about the care they should receive for their specific conditions. Some examples of process measures include the percentage of people receiving pain relief medications for their OA or the percentage of people with OA who have been offered core treatments prior to their surgery consultations. These measures are the most common quality measures used for public reporting (Agency for Healthcare Research and Quality, 2015) and they are the primary measures focused in this thesis.

*Outcome measures* - Outcome is the effect of care on the health status of patients (Donabedian, 1988). An outcome is the result of multiple factors, some of which are not within the providers' control. Some of the examples of outcome measures include the percentage of patients with persistent chronic pain following joint replacement surgery or the rate of surgical complications post joint replacement (Agency for Healthcare Research and Quality, 2015).

The interactions of each component of care can be portrayed as the structure acting as a 'vehicle' in delivering and receiving care (process) to achieve an outcome (S. M. Campbell et al., 2000). The three components allow for inferences to be drawn about quality of care and help elucidate the possible causes and solutions to the existing quality matters (S. M. Campbell et al., 2000; Donabedian, 1988).

#### *Sources of data*

Data for healthcare quality measures must be accessible, valid, complete, and relevant (Baker, 2000). Data can generally be collected from different sources, including administrative data, medical records and patient surveys (Agency for Healthcare Research and Quality, 2018b). Administrative data and patient medical records contain

rich clinical details but do not typically collect data on preventative care. It is also a costly, time-consuming, and complex process to compile data for patients receiving services across health care settings with different recording formats (Agency for Healthcare Research and Quality, 2018b); (S. M. Campbell et al., 2002).

Patient surveys are commonly used to capture information from an individual's perspective about health care experiences and are typically designed to be patient-friendly so that patients can relate to the survey results. Surveys can be administered online, by mail or via phone interviews and may include reports on the care, service, or treatments received as well as perceptions of the care outcomes. In addition, there are often well-established methods to design and administer patient surveys. Nevertheless, surveys can produce misleading results if the questions are poorly worded or use unstandardized survey administration procedures. Therefore, to ensure that quality data are accurately reflecting the actual performance/practice, it is essential to collect data carefully and consistently using standardized definitions and procedures (Agency for Healthcare Research and Quality, 2018b; Hrisos et al., 2009). Patient surveys have been previously used to assess OA quality of care, for example OA QI tools (Blackburn et al., 2016; Osteras et al., 2013), in order to promote high-quality care and achieve benchmarks. This type of survey is used in Study Two of this thesis.

## **2.4 Quality indicators**

As outlined in Section 2.3.3, the primary quality measures used in Study Two of this thesis are process measures and QIs. Quality indicators are specific measurable items that represent minimally acceptable standards of practice for the health condition of interest (Catherine H. MacLean et al., 2004; Westby et al., 2016). Quality indicators are often derived from retrospective reviews of medical records (J. Broadbent et al., 2008; Eumusc.net, 2008; Marshall et al., 2002; National Institute for Health and Care Excellence, 2015; Steel et al., 2007). They can also be utilised as a self-reported assessment (Jansen et al., 2010; Peter et al., 2013) or be assessed via independent/peer review of practice (van den Hombergh et al., 1999). Auditing medical records and review of practice are both expensive and time-consuming methods. The former requires consistent and accurate information data recording by clinicians in order for the data to be accurate (S. M. Campbell et al., 2002), whilst the latter can be intrusive

to both clinicians and patients and is influenced by the particular point of care at which data occurred. Conversely, patient-reported surveys for measuring QIs are an inexpensive method and can be administered by mail, by telephone, or via the Internet.

Across all methods, benefits of using QIs for quality measurement include: benchmarking to help stimulate and motivate change; assisting in targeting resources to areas of utmost need; identifying unacceptable practice; instigating informed debate about the existing quality of care; and evaluating any quality improvement initiatives. They are also quick and low-cost tools to assess quality (Marshall et al., 2002).

However, the use of QIs can also pose problems as only easily measurable elements of care can be assessed, and subjective aspects of the care can be overlooked. Other disadvantages of using QIs for quality measurement include the tendency to encourage a blame culture, potential manipulation of data by health professionals/involved organisations particularly when indicators are not met, the need for QI updates according to advances in treatment and difficulty interpreting results from the QIs (e.g. discrepancy in care may be related to case complexity or random differences rather than a real gap in the quality of care) (Marshall et al., 2002; Rubin et al., 2001). Thus, it is imperative that QIs are based on high levels of evidence and are developed using evidence-based methods (S.M. Campbell et al., 2003; Kötter et al., 2012).

#### ***2.4.1 Development of quality indicators***

Both non-systematic and systematic methods can be used to develop QIs. Non-systematic methods often involve a group of people coming together to discuss a certain topic based on available information (S.M. Campbell et al., 2003). Quality indicators derived from these methods are not always evidence-based, have less credibility and may only be applicable to the inventors (S.M. Campbell et al., 2003; Marshall et al., 2002). Quality indicators developed via systematic approaches are generally based on empirical studies. However, QIs that are solely evidence-based may also have some limitations. For instance, there are many ‘grey’ areas in clinical practice where evidence is still limited or incomplete and clinical reasoning based on experience is needed (S.M. Campbell et al., 2003; Naylor, 1995).

For that reason, systematic methods that incorporate scientific evidence with expert opinion are regarded as the most rigorous ways to develop QIs. These methods

recognize the importance of evidence-based care plus take into consideration expert opinion to produce acceptable and useful QIs for the health condition of interest (S. M. Campbell et al., 2002; Marshall et al., 2002). Nevertheless, experts often have different opinions and may fail to reach consensus on the interpretation of some evidence. Using structured consensus methods can help with gaining consensus amongst a group of experts (S.M. Campbell et al., 2003). One structured consensus method, that will be used in Study One, is the Delphi method.

#### *Delphi method*

The Delphi method is commonly used to establish agreement amongst a group of individuals on a certain issue without the need for a face-to-face meeting (Fink et al., 1984; Keeney et al., 2010). It is widely used to establish priorities in health care and research (Jones et al., 1995; Keeney et al., 2010). Experts rate their individual opinions over a series of questionnaires (commonly known as rounds) (S.M. Campbell et al., 2003; Fink et al., 1984). This mode of delivery also allows for a selection of experts from a geographically dispersed population (S.M. Campbell et al., 2003). Responses from each round are summarized and reported back to all participants to be re-rated in the subsequent round. This process aims to encourage participants to revise their earlier responses in light of the responses from other participants (Diamond et al., 2014). The structure of the questionnaires in subsequent rounds is determined by the responses in earlier rounds.

#### **2.4.2 Clinimetric properties of quality indicators**

When selecting a QI tool to use, it is important to consider its clinimetric properties (i.e. reliability, validity, etc.). Tools with high validity and reliability will help ensure the results are an accurate reflection of the clinical behaviour assessed and can be used to guide decision-making to improve clinical services (Hrisos et al., 2009).

There are six clinimetric properties that should be considered as a minimum prior to implementation of a QI tool (S. M. Campbell et al., 2002; Westby et al., 2016). These include importance, validity, reliability, feasibility, acceptability and measurability (S. M. Campbell et al., 2002; Westby et al., 2016). A QI tool is considered important if it is of a high priority (e.g. high incidence/prevalence of the condition, mortality, or

morbidity) and is essential to improve health. A valid QI item/tool is one that has clear benefits to the patient receiving the care if performed and is supported by evidence-based practice guidelines and expert consensus (Westby et al., 2016). There are different types of validity, including content, construct, and criterion validity. Content validity examines the extent to which the content of an instrument adequately reflects the construct measured and construct validity refers to the extent to which the scores of an instrument are consistent with hypotheses relating to the construct measured. Criterion validity refers to the extent to which the scores of an instrument adequately reflect a 'gold standard' (Mokkink et al., 2020).

In terms of reliability, a reliable QI item/tool has minimal measurement error and generates data that can be reproduced by anyone who administers it (inter-rater reliability) or by the same person administering the tool at different times (intra-rater/test-retest reliability) (Westby et al., 2016). Another type of reliability is internal consistency. Internal consistency is the extent to which items within an instrument are interrelated (Mokkink et al., 2020). A QI tool is considered feasible if the data are gathered from readily available sources (such as clinical charts, electronic health records or patient-reported), can be collected with minimal cost and burden, and has clear, reproducible data collection methods. An acceptable QI tool aligns with professional and patient values and clinical practice, is useful for decision-making purposes and all items in the tool must be within the control of the person delivering the care. It also needs to be acceptable to the assessor and the health professional (S. M. Campbell et al., 2002). Finally, a measurable QI tool is one that can be operationalised and measured as a nominal (e.g. 'yes' or 'no') variable, as well as can detect changes in quality of care (Westby et al., 2016).

## **2.5 Existing quality indicators for osteoarthritis care**

A 2013 systematic review of QIs for the primary care of OA identified ten QI tools from 32 papers relating to non-pharmacological, pharmacological and surgical management for OA (Edwards et al., 2015). The QI items were mostly process measures relating to holistic OA assessment (including pain and function), OA education and information, exercise prescription or physiotherapy, weight management, assessment of needs for assistive devices (including ambulatory and non-

ambulatory), use of analgesics (including paracetamol and oral NSAIDs) and/or gastroprotective agents in OA, referral to a specialist, and X-ray imaging use when OA symptoms are refractory to non-surgical treatments. Three of the QI items measured outcome, two of which assessed improvement in pain and function following OA treatments and one evaluated workforce participation. A second systematic review with similar purpose was published in 2018 but no new QIs were identified (Petrosyan et al., 2017).

These QI tools were assessed for their quality (Edwards et al., 2015) and the reviewers established that there were no conflicts of interest identified in the QIs' development and implementation processes. The QI tools were found to be feasible, reproducible in other studies, and were predominantly developed based on robust evidence and consensus methods (e.g. RAND Appropriateness method, the Delphi technique). In addition, most of the QI tools had been tested for their reliability (such as test-retest or inter-rater reliability). However, sensitivity to change was not assessed in any of the QI tool development, testing, or implementation studies (S. M. Campbell et al., 2002).

QI tools for OA have collected data by reviewing medical records (Asch et al., 2004; Joanne Broadbent et al., 2008; Kirk et al., 2003; Steel et al., 2007; Zingmond et al., 2009) and/or via phone interviewing (Cadogan et al., 2005; Chodosh et al., 2004; Ganz et al., 2006; T. Higashi et al., 2005; T. Higashi et al., 2004; C. H. MacLean et al., 2006; McGlynn et al., 2003; Wenger et al., 2003) or postal surveys (Li et al., 2011). Only one study from Norway (Osteras et al., 2013) was identified that implemented the QI tool in a patient-reported format. The authors advocated for an increased use of patient-reported QIs to help identify changes in process delivery and outcomes over time (Edwards et al., 2015). Subsequently, another patient-reported QI tool for OA was developed in the UK (Blackburn et al., 2016). The development of a new patient self-reported QI tool is the primary focus of Study Two in this thesis.

The next two sections will provide further detail on the two patient-reported QI tools developed in Norway (Osteras et al., 2013) and the UK (Blackburn et al., 2016).

### ***2.5.1 Patient-reported quality indicators for osteoarthritis (Norway)***

The Norwegian study in 2013 was the first study to develop a patient-reported QI tool to evaluate pass rates for OA care from the patients' perspective (Osteras et al., 2013).

The study identified all papers (published between 2000-2010) that reported OA QIs before comparing the indicators and arranging them by content areas. They included Assessing Care of Vulnerable Elders (ACOVE) indicators, which were deemed as high quality due to their robust evidence base and consensus development method, field testing and updates from previous version (ACOVE-3) (Edwards et al., 2015).

The identified QIs were converted into question format by the authors, who worked in rheumatology and had experience with designing questionnaires. The new QI tool was then pilot tested with thirteen people with OA, and a brief interview was conducted subsequently with the participants to assess their understanding of the tool. The QI tool consisted of 17 items, six of which addressed patient education and information about OA, four related to regular OA assessments, another four were based on pharmacological treatments and three focused on OA referrals (Figure 2.11).

Table 1. The OsteoArthritis Quality Indicator Questionnaire

| Questions on the treatment of your osteoarthritis                                                                                                                                                                                                    |                                                                                                                                                                                                                                |                          |                          |                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| There are several different treatment alternatives for osteoarthritis. We would like to know what treatment, information, or advice that you have been given for your osteoarthritis. For each question, please cross off one of the boxes provided. |                                                                                                                                                                                                                                |                          |                          |                          |
|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                | Yes                      | No                       | Don't remember           |
| 1                                                                                                                                                                                                                                                    | Have you been given information about how the disease usually develops over time?                                                                                                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2                                                                                                                                                                                                                                                    | Have you been given information about different treatment alternatives?                                                                                                                                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3                                                                                                                                                                                                                                                    | Have you been given information about how you can live with the disease?                                                                                                                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4                                                                                                                                                                                                                                                    | Have you been given information about how you can change your lifestyle?                                                                                                                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5                                                                                                                                                                                                                                                    | Have you been given information about the importance of physical activity and exercise?                                                                                                                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6                                                                                                                                                                                                                                                    | Have you been referred to someone who can advise you about physical activity and exercise? (e.g., a physiotherapist)                                                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                | Yes                      | No                       | Not overweight           |
| 7                                                                                                                                                                                                                                                    | If you are overweight, have you been advised to lose weight?                                                                                                                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8                                                                                                                                                                                                                                                    | If you are overweight, have you been referred to someone who can help you to lose weight?                                                                                                                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                | Yes                      | No                       | No such problems         |
| 9                                                                                                                                                                                                                                                    | If you have had problems related to daily activities, have these problems been assessed by health personnel in the past year?                                                                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10                                                                                                                                                                                                                                                   | If you have problems with walking, has your need for a walking aid been assessed? (e.g., stick, crutch, or walker)                                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11                                                                                                                                                                                                                                                   | If you have problems related to other daily activities, has your need for different appliances and aids been assessed? (e.g., splints, assistive technology for cooking or personal hygiene, a special chair)                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                | Yes                      | No                       | No pain/discomfort       |
| 12                                                                                                                                                                                                                                                   | If you have pain, has it been assessed in the past year?                                                                                                                                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13                                                                                                                                                                                                                                                   | If you have pain, was acetaminophen the first medicine that was recommended for your osteoarthritic pain?                                                                                                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14                                                                                                                                                                                                                                                   | If you have prolonged severe pain, which is not relieved sufficiently by paracetamol, have you been offered stronger pain killers? (e.g., co-proxamol, co-dydramol, tramadol, co-codamol, dihydrocodeine, codeine)             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15                                                                                                                                                                                                                                                   | If you are taking antiinflammatory drugs, have you been given information about the effects and possible side effects of this medicine? (e.g., ibuprofen, Nurofen, Brufen, diclofenac, Voltarol, naproxen, Naprosyn, Celebrex) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16                                                                                                                                                                                                                                                   | If you have experienced an acute deterioration of your symptoms, has a corticosteroid injection been considered?                                                                                                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                | Yes                      | No                       | Not severely troubled    |
| 17                                                                                                                                                                                                                                                   | If you are severely troubled by your osteoarthritis, and exercise and medicine do not help, have you been referred and assessed for an operation? (e.g., joint replacement)                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**Figure 2.11 Patient-reported osteoarthritis quality indicators questionnaire from Norway. Taken from Østerås et al. (2013).**

*Clinimetric properties of the QI tool from Norway*

The clinimetric properties of the QI tool from Norway were tested in two studies. In the first study (Osteras et al., 2013), test-retest reliability as well as content and construct validity were examined. Ninety-nine patients with self-reported OA were recruited from a larger study (population-based postal survey) in regional Norway. Part of the study required patients to attend a clinical examination for their OA where no interventions were provided. Patients were asked to complete the QI tool amongst a range of other questionnaires prior to their clinical appointments and again two weeks after. Only patients who had not received any information, advice or treatment for their OA between attending the clinical examination and the second administration were included in the test-retest reliability assessment assessed using Cohen's Kappa for single items (Osteras et al., 2013).

Content validity was assessed by two patient research partners and expert panels. Construct validity was assessed with ten predefined hypotheses, with the authors considering construct validity to be established if >75% of the hypotheses were confirmed (Terwee et al., 2007).

The test-retest reliability estimates for single items of the QI tool ranged from 0.20–0.80 with observed agreement of 62-90%. Content validity and all ten pre-defined hypotheses regarding construct validity were confirmed (Osteras et al., 2013). This study has several strengths. The QI tool consisted of high-quality evidence-based items (i.e. QIs from the ACOVE tool) that were further validated by the OA experts and consumers. The study also recruited 99 participants for the clinimetric testing of the QI tool, which exceeds the minimum sample size requirement (>50) for any health questionnaire validity and/or reliability study (Terwee et al., 2007). However, test-retest reliability for individual items considerably varied (as indicated by the Cohen's Kappa point estimates and CIs), with only two of the 17 items achieving high estimates ( $\geq 0.70$ ). This is likely due to ambiguity identified in some of the QI items, where the meaning might be interpreted differently across participants. Therefore, the QI tool needs to be further refined by potentially removing or revising the ambiguous items (i.e. those with low estimates) to improve its clinimetric properties prior to future use.

The QI tool was revised in 2015, where minor wording revisions were made to the items; additional response category headings were added; and one item (relating to provision of information to change patient's lifestyle) was considered redundant and therefore removed from the questionnaire. Consequently, the revised QI tool was re-tested for its clinimetric properties including additional properties such as absolute reliability, responsiveness and interpretability (Osteras et al., 2018). Patients with OA (n= 156) were referred by their general practitioners to a multidisciplinary OA patient education program at a hospital in the capital of Norway. Patients were required to complete the Norwegian QI tool two weeks before (T1), immediately before (T2), immediately after (T3), and three months after (T4) the OA patient education program.

Patient test-retest reliability was assessed between T1 and T2 for 92 participants using intraclass correlation coefficient (ICC) and 95% (CI) for the total questionnaire score and Cohen's Kappa for single items. Construct validity and responsiveness were assessed with six pre-defined hypotheses, where 75% of them should be confirmed (Terwee et al., 2007). Responsiveness concerns the degree to which an instrument can detect change over time in the construct to be measured (Mokkink et al., 2020). Responsiveness was further evaluated for single item pass rates based on three pre-defined hypotheses for each item, where two of the three hypotheses needed to be confirmed. Interpretability was evaluated based on the floor and ceiling effects, smallest detectable change (SDC) and minimal important change (MIC). Interpretability is the extent to which one can assign qualitative meaning (Mokkink et al., 2020). Floor and ceiling effects at T1 were considered present if >15% of the patients scored the lowest or highest possible score (range 0-100). The MIC was determined by the mean change method (Jaeschke et al., 1989) and was based on patients' selected responses (not at all/to a little extent/to some extent/to a large extent/to a very large extent) to the additional question (satisfaction with the provided information and advice) asked at T3. If the response 'to a large extent' was selected by patients, they were considered to have experienced a meaningful change (Osteras et al., 2018). The SDC (95%) was calculated at individual ( $SDC_{ind} = 1.96 \times \sqrt{2} \times \text{standard error of measurement (SEM)}$ ) and group level ( $SDC_{group} = SDC_{ind} / \sqrt{n}$ ). The SDC should be smaller than the MIC (Terwee et al., 2007).

The ICC (95% CI) for the total questionnaire score was 0.89 (0.83, 0.93). The test-retest reliability estimates (Cohen's Kappa) for single items ranged from 0.38–0.85 with observed agreement of 69-92%. All predefined hypotheses regarding construct validity were confirmed. Three of the four pre-defined hypotheses regarding responsiveness were confirmed. In addition, 33 of the 48 pre-defined hypotheses (for single items) regarding responsiveness were also confirmed. There were no floor or ceiling effects detected. The MIC was 20.4 (based on the responses presented on a five-point Likert scale). The SDC for group level (3.0) was below the MIC, however, the SDC for individual level was 29.1 (Osteras et al., 2018). In summary, the test-retest reliability for the total score of the QI tool was acceptable although reliability for single items varied. The QI tool also had acceptable construct validity and responsiveness. The change scores for the mean total pass rate at a group level should be greater than 3.0 to exceed the measurement error and should be over 20 to be considered an important change. The QI tool was deemed important and acceptable because it had been validated by the OA experts and consumers. It was also considered feasible as data could be easily obtained from the patients. Finally, the QI tool was also easily measurable based on its scoring system. Although this QI tool appears to be a useful tool in general to assess OA care, it is not tailored to specifically evaluate physiotherapy care for people with hip and/or knee OA.

### ***2.5.2 Patient-reported quality indicators for osteoarthritis (UK)***

Blackburn and colleagues (Blackburn et al., 2016) developed a similar patient-reported QI tool to assess OA care in primary care settings. The development of the QI tool was conducted in consultation with their 'research user group' in the UK comprising members who had experience participating in research and living with musculoskeletal and other chronic conditions. Ten members of the research user group were invited to attend four discussion groups with the research team over a three-year period from 2009- 2012. The members were asked to identify important and relevant OA QIs for primary care settings before being presented with five QIs from a previous systematic review (Edwards et al., 2015). These QIs were part of a model of OA consultation for general practitioners to support self-management. They were related to OA education and advice, exercise and weight loss, and advice on pain relief (such as paracetamol and topical NSAIDs). The members were asked to consider individual QI and other

important factors when consulting their general practitioners for OA before suggesting potential QIs to capture the quality of care from a patient perspective. They were also involved in developing the wording and response options for the QI tool.

The draft QI tool was then compared with items from the Norwegian QI tool (Osteras et al., 2013), which had been translated from Norwegian to English by the Norwegian developers. As both questionnaires contained some similar items, the UK-QI tool added some items directly from the Norwegian QI tool with minor wording changes and removed some of their original items. The members of the research user group were involved in considering the appropriateness of the wordings used in the Norwegian QI tool and in the final refinement of the UK-QI tool. They were also asked to assess the face validity of the QI tool by commenting on its layout, design, and ease of use, and identifying items that were ambiguous or difficult to comprehend. The UK-QI tool was not tested for its clinimetric properties because most of its items (14 out of 15 items) were identical to those in the Norwegian tool, thus, their clinimetric properties were likely to be similar.

The UK-QI tool was subsequently administered to patients across the UK, the Netherlands, Norway, Denmark and Portugal to assess the OA care they received from different healthcare professionals (Figure 2.12) (Dziedzic et al., 2016; EIT Health, 2020; Schiphof et al., 2017).

Although the UK-QI tool is not designed to specifically evaluate physiotherapy care for people with hip and/or knee OA, similar phrasings of the items were utilised in Study Two of this thesis because the questionnaire went through a rigorous development process, involved patient engagement and involvement, and was based on the most recent QIs (from the systematic review in 2013 (Edwards et al., 2015)) and the QI tool from Norway (Osteras et al., 2013). This tool was deemed important and acceptable because it had been validated by the OA experts and patients. It was also considered feasible as data could be conveniently gathered from the patients. Finally, the QI tool came with a scoring system, thus, it was easily measurable. The clinimetric properties of the UK-QI tool (i.e., reliability and validity) are likely to be similar to the Norwegian tool, but this needs further exploration and was evaluated in Study Two of this thesis.

### Questions about the treatment of your joint pain

There are several different treatments for joint pain.

We would like to know what treatment, information or advice you have received from health professionals for your joint pain in the **past 3 months**.

For each question, please put a cross in one of the boxes provided.

|                                                                                                                    | Yes                      | No                       | Don't remember           |
|--------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| Have you been given information about joint pain from a health professional?                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you been given information about different treatment alternatives?                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you been given any advice on how you might help yourself to manage or deal with your joint pain?              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you been given any support on how you might help yourself to manage or deal with your joint pain?             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you been given information or advice about physical activity and exercise to help you with your joint pain?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you been offered a referral to a health professional who can advise you about physical activity and exercise? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                                                                  | Yes                      | No                       | Not overweight           |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| Have you been advised to lose weight?                                                                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If you are overweight, have you been offered a referral to services for losing weight (e.g. a dietician or a weight-loss group)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                                                                                                                                        | Yes                      | No                       | No such problems         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| If you have had problems with daily activities, have these problems been assessed by a health professional?                                                                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If you have problems with walking, has your need for a walking aid (e.g. stick, crutch or walker) been assessed?                                                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If you have problems with other activities of daily living, has your need for appliances and aids (e.g. splints, assistive technology for cooking or personal hygiene, a special chair) been assessed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                            | Yes                      | No                       | No pain                  |
|----------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| If you have joint pain, has it been assessed by a health professional?     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| If you have joint pain, was paracetamol the first pain killer recommended? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

|                                                                                                                                                                                                                                               |                          |                          |                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|-------------------------------------------------------|
|                                                                                                                                                                                                                                               | <b>Yes</b>               | <b>No</b>                | <b>No<br/>prolonged<br/>severe pain</b>               |
| If you have prolonged severe joint pain, for which paracetamol does not provide pain relief, have you been offered stronger pain killing medications (e.g. co-codamol, codeine, tramadol, co-proxamol, co-dydramol, dihydrocodeine)?          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                              |
|                                                                                                                                                                                                                                               | <b>Yes</b>               | <b>No</b>                | <b>Not taking<br/>such<br/>medications</b>            |
| If you use anti-inflammatory medications (e.g. ibuprofen (Nurofen, Brufen), diclofenac (Voltarol), naproxen (Naprosyn), celecoxib (Celebrex)), have you been given information about the effects and possible side-effects of the medication? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                              |
|                                                                                                                                                                                                                                               | <b>Yes</b>               | <b>No</b>                | <b>Not<br/>experienced<br/>such<br/>deterioration</b> |
| If you have experienced an acute deterioration of your joint pain, have you been offered a steroid injection?                                                                                                                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                              |
|                                                                                                                                                                                                                                               | <b>Yes</b>               | <b>No</b>                | <b>Not severely<br/>troubled</b>                      |
| If you are severely troubled by your joint pain, and exercise and medicine do not help, have you been offered a discussion about the benefits and risks of a joint replacement operation with a health care professional?                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                              |
|                                                                                                                                                                                                                                               | <b>Yes</b>               | <b>No</b>                | <b>Don't<br/>remember</b>                             |
| Have you discussed and agreed with your health professional when you will have a review of your joint pain and treatment?                                                                                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>                              |

**Figure 2.12 Patient-reported osteoarthritis quality indicators questionnaire from the United Kingdom. Taken from the EIT Health (2020).**

## 2.6 Quality indicators for physiotherapy care of hip and/or knee osteoarthritis

Physiotherapists are important providers of non-surgical care for people with hip and knee OA. In Australia, general practitioners most frequently refer their patients with OA to physiotherapists compared with other allied health providers (Brand et al., 2014). Thus far, four studies have developed clinician self-reported QI tools to specifically evaluate physiotherapy care for people with hip and/or knee OA.

In the first Dutch study (Jansen et al., 2010), physiotherapists (n= 27) were recruited to treat patients (n= 103) diagnosed with hip and/or knee OA and as part of the study, they were required to record the treatments provided. The participating physiotherapists were also asked to provide treatments based on the first version of the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Vogels et al., 2003). The treatment data were then assessed using QIs derived from the same clinical

guidelines. The first author of the study formulated the QIs based on the key recommendations from the clinical guidelines (Vogels et al., 2003). However, no consensus method was used to develop the QIs. There was no further description of the steps taken to validate the QIs and no testing was completed to assess their clinimetric properties. Although these QIs were deemed important to evaluate quality of OA care, there was no input from other health professionals and patients when developing the QIs so they might not necessarily align with professional and consumer values. Therefore, the acceptability, reliability, and validity of the QIs are not known. However, the QIs were considered feasible as they could be easily utilised by physiotherapists to record treatments provided to people with hip and/or knee OA. They were also measurable as their scoring system was provided. In total, there were 17 QI items, three of which related to OA diagnosis, another six focused on treatment strategies and the final eight were based on the treatment outcomes (Table 2.3). This QI tool lacked items pertaining to weight loss management and contained items relating to adjunctive treatments (such as massage and electrotherapy), which had conflicting evidence to support their use (Bannuru et al., 2019; Kolasinski et al., 2020).

**Table 2.3 Quality indicators used to measure physiotherapists' adherence to recommendations from Dutch clinical guidelines for hip and knee OA. Taken from Jansen et al. (2010).**

| Quality indicators for hip and knee osteoarthritis                                                                                                                                                   | Answers                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Diagnosis</i>                                                                                                                                                                                     |                                                                                                                                                                |
| 1. Problem areas recorded                                                                                                                                                                            | Yes/No                                                                                                                                                         |
| 2. Patient profile recorded                                                                                                                                                                          | Yes/No                                                                                                                                                         |
| 3. Measurement of the Visual Analogue Scale (for severity of pain) and Algo-functional Index (for physical function assessment) at baseline, six weeks after and at the end of the treatment episode | Yes/No                                                                                                                                                         |
| <i>Treatment</i>                                                                                                                                                                                     |                                                                                                                                                                |
| 4. Osteoarthritis information and advice                                                                                                                                                             | Yes/No                                                                                                                                                         |
| 5. Exercise for body functions                                                                                                                                                                       | Yes/No                                                                                                                                                         |
| 6. Exercise for activities                                                                                                                                                                           | Yes/No                                                                                                                                                         |
| 7. Massage therapy                                                                                                                                                                                   | Yes/No                                                                                                                                                         |
| 8. Physical modalities use (other than transcutaneous electrical nerve stimulation)                                                                                                                  | Yes/No                                                                                                                                                         |
| 9. Aftercare (home exercise program, follow up, advice to participate in community sports or sports program)                                                                                         | Yes/No                                                                                                                                                         |
| <i>Outcome</i>                                                                                                                                                                                       |                                                                                                                                                                |
| 10. Visual Analogue Scale for pain severity (scale ranges from 0 to 100)                                                                                                                             | 0 = No pain<br>100 = Severe pain                                                                                                                               |
| 11. Algo-functional Index (scores range from 1 to 24)                                                                                                                                                | 1-4: Minimal restriction<br>5-7: Moderate restrictions<br>8-10: Severe restrictions<br>11-13: Very severe restrictions<br>14-24: Extremely severe restrictions |
| 12. The extent to which the treatment goals were achieved (measured on a 5-point Likert scale)                                                                                                       | No change<br>Slightly<br>Moderately<br>Almost completely<br>Completely                                                                                         |
| 13. Patient satisfaction with treatment (scores range from 0 to 10)                                                                                                                                  | 0 = Very bad<br>10 = Excellent                                                                                                                                 |
| 14. Global perceived effect either for pain or for restrictions in daily activities (measured on a 5-point Likert scale)                                                                             | A lot less<br>A bit less<br>No change<br>A bit more<br>A lot more                                                                                              |
| 15. Number of sessions                                                                                                                                                                               | Free text                                                                                                                                                      |
| 16. Duration of treatment episodes                                                                                                                                                                   | Free text                                                                                                                                                      |
| 17. Treatment frequency                                                                                                                                                                              | Free text                                                                                                                                                      |

A second Dutch study also developed QIs to evaluate physiotherapy management of people with hip and knee OA (Peter et al., 2013). The first author of the study drafted a list of QIs based on a second version of the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Peter et al., 2011) and was also the first author of the clinical guidelines used. Co-authors of the clinical guidelines were then invited to review the QIs and provide feedback. Subsequently, an expert panel of physiotherapists (n= 16) working in primary (n= 9) and secondary (n= 7) care was invited via email to prioritise the QIs that were the most relevant for physiotherapy practice. Participating physiotherapists all had more than ten years' experience treating people with OA and

had completed advanced training courses for OA management. Adherence to the QIs was measured using a five-point Likert scale (0 = never, 1 = seldom, 2 = sometimes, 3 = generally, and 4 = always).

The QIs were then pilot tested amongst physiotherapists working in primary care (n= 15) and researchers with expertise in medical education (n= 3, all co-authors) to improve their clarity and completeness. A list of 19 QIs was generated, three of which related to OA diagnosis, another twelve focused on treatment strategies, and the final four were associated with treatment evaluation (Table 2.4). One of the diagnosis indicators was later removed due to lack of discriminative power (part of the clinimetric properties testing), so the final list contained 18 QIs.

#### *Clinimetric properties of the Dutch quality indicator questionnaire*

The second Dutch study (Peter et al., 2013) tested the QI tool for its test-retest reliability and internal consistency. In this study, physiotherapists of different clinical expertise (n= 243) were recruited to complete the online QI tool, and approximately 19% (n= 46) completed the same questionnaire seven days later to determine its test-retest reliability (based on ICC and 95% CI for the average scores). Internal consistency was based on the scores of all responding physiotherapists (n= 243) and calculated using Cronbach's  $\alpha$  (Kline, 1999). The ICC and 95% CI for the questionnaire (average scores) was 0.89 (0.80, 0.94) and Cronbach's  $\alpha$  for internal consistency was 0.63. The QI tool appears to have acceptable test-retest reliability and moderate internal consistency (Terwee et al., 2007). It was perceived to be important and acceptable to the physiotherapists given their input in its development. It was also considered feasible as physiotherapists could easily record the treatments provided to patients. Finally, the QI tool was also easily measurable using the five-point Likert scale. Although this QI tool appears to be a useful tool to assess physiotherapy care for hip and knee OA, it was not developed using systematic consensus methods, which are the most rigorous ways to develop QIs (S. M. Campbell et al., 2002). In addition, this QI tool was designed for physiotherapists to perform a self-reported quality assessment, which is beneficial for self-auditing purposes but could result in reporting bias.

**Table 2.4 Quality indicators developed from a revised version of Dutch clinical guidelines for hip and knee OA. Taken from Peter et al. (2013).**

| <b>Quality indicators for hip and knee osteoarthritis</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Diagnosis</b>                                          | <ol style="list-style-type: none"> <li>1. Inventory of health-related problems according to the International Classification of Functioning, Disability and Health.</li> <li>2. Assessing the presence of personal and environmental problems as these relate to the limitations in activities and restrictions in participation.<sup>a</sup></li> <li>3. Assessing the presence of hip and knee OA-specific 'red flags'.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Treatment</b>                                          | <ol style="list-style-type: none"> <li>4. Treating patients with strengthening of muscles.</li> <li>5. Treating patients with improving of aerobic capacity.</li> <li>6. Treating patients with walking exercises.</li> <li>7. Treating patients with functional exercises.</li> <li>8. Treating patients with postoperative exercises.</li> <li>9. Providing information concerning knowledge and understanding of OA of the hip and/or knee.</li> <li>10. Providing information concerning the consequences for the patient's functional performance in terms of movements, activities and participation.</li> <li>11. Providing information concerning the relationship between burden and tolerance level.</li> <li>12. Providing information concerning the way a patient copes with health problems</li> <li>13. Providing information concerning what constitutes an active and healthy lifestyle (in terms of exercise and nutrition/overweight).</li> <li>14. Providing information concerning behavioural change (regarding physical activity).</li> <li>15. Providing information concerning joint protection and the use of aids.</li> </ol> |
| <b>Treatment evaluation</b>                               | <ol style="list-style-type: none"> <li>16. Evaluating treatment with the recommended measurement instruments.</li> <li>17. Evaluating treatment with the combination of a questionnaire and a performance test.</li> <li>18. Evaluating treatment with a patient-specific complaint list.</li> <li>19. Evaluating treatment with the Timed Up and Go test.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

<sup>a</sup>This indicator was removed due to poor discriminative power

Subsequently, another set of QIs for physiotherapy management of hip and knee OA was established using a Delphi technique (Peter et al., 2016). The research team drafted a list of QIs from the second version of the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Peter et al., 2011). A multidisciplinary expert panel (n= 19) was invited to participate in an online two staged-Delphi survey to prioritise QIs that were most relevant to physiotherapy practice as well as to provide any comments. The panel consisted of physiotherapists from primary or secondary care, patients, rheumatologists, general practitioners, orthopaedic surgeons, rehabilitation specialists, researchers in the field of OA, as well as representatives of the Dutch Arthritis Foundation and the Arthritis Patient Organization.

The final list of 17 QIs contained relevant literature references for each indicator and when there was no evidence, the indicator was stated as based on expert opinion (Table 2.5). The pass rates for the QIs could be calculated based on the numerator and denominator provided (Peter et al., 2016). Strengths of the study include robust methodology to develop the QIs (e.g. utilisation of the Appraisal of Guidelines for Research and Evaluation II tool to guide QI development, consensus method to identify and prioritise the QIs) and the involvement of a multidisciplinary team in the consensus exercise. The study has some limitations. The final list of QIs contained items relating to adjunctive treatments (such as taping and manual therapy) that had conflicting evidence to support their use (Bannuru et al., 2019; Kolasinski et al., 2020), which may create uncertainties amongst physiotherapists when using the QIs to assess their practice. Moreover, the QIs were not developed with an international perspective because only a national group of experts was recruited for the Delphi panel. In terms of the clinimetric properties of the QIs, no clinimetric testing was conducted, so their reliability and validity were not determined. However, the QIs were deemed important and acceptable because they had been validated by the multidisciplinary expert panel. They were considered feasible as data could be collected from electronic medical records. Finally, they were also measurable as the scoring system for pass rates was provided.

**Table 2.5 Quality indicators for physiotherapists when managing people with hip and knee osteoarthritis. Taken from Peter et al. (2016).**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Quality indicators for hip and knee osteoarthritis</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1. The physiotherapist should assess health-related problems according to all five domains of the International Classification of Functioning, Disability and Health (ICF).<br><br>Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom the health-related problems are assessed according to all five domains of the ICF.<br><br>Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.<br><br>Expert opinion                                                                                                                                                                                                                                                                                                                                                                                       |
| 2. The physiotherapist should assess barriers and facilitators for physiotherapy treatment.<br><br>Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom barriers and facilitators for physiotherapy treatment are assessed.<br><br>Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.<br><br>Expert opinion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3. The physiotherapist should evaluate red flags specific for hip and knee osteoarthritis.<br><br>Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom red flags specific for hip and knee osteoarthritis are evaluated.<br><br>Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.<br><br>Expert opinion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4. Based on clinical reasoning and shared decision making, the physiotherapist should set specific, measurable, attainable, results-orientated and timely (SMART) treatment goals.<br><br>Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom, based on clinical reasoning and shared decision making, SMART treatment goals are set.<br><br>Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.<br><br>Expert opinion                                                                                                                                                                                                                                                                                                                                                                           |
| 5. The physiotherapist should provide information regarding a healthy lifestyle (physical activity, risk of overweight) and the relationship between the mental and physical load and load-bearing capacity.<br><br>Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom information regarding a healthy lifestyle (physical activity, risk of overweight) and the relationship between the mental and physical load and load-bearing capacity is provided.<br><br>Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.<br><br>French SD, Bennell KL, Nicolson PJ, Hodges PW, Dobson FL, Hinman RS (2014). What do people with knee or hip osteoarthritis need to know? An international consensus list of essential statements for osteoarthritis. <i>Arthritis Care and Research</i> 67: 809–16. |

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6. The physiotherapist should provide information regarding knowledge, understanding and possible consequences of progression of hip and knee osteoarthritis.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months and in whom information regarding knowledge, understanding and possible consequences of progression of hip and knee osteoarthritis is provided.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.

French SD, Bennell KL, Nicolson PJ, Hodges PW, Dobson FL, Hinman RS (2014). What do people with knee or hip osteoarthritis need to know? An international consensus list of essential statements for osteoarthritis. *Arthritis Care and Research* 67: 809–16.

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7. The physiotherapist should provide information regarding joint protection and the use of walking aids.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months in whom information regarding joint protection and the use of walking aids is provided.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.

Jones A, Silva PG, Silva AC, Colucci M, Tuffanin A, Jardim JR, Natour J (2012). Impact of cane use on pain, function, general health and energy expenditure during gait in patients with knee osteoarthritis: a randomised controlled trial. *Annals of the Rheumatic Diseases* 71: 172–9.

French SD, Bennell KL, Nicolson PJ, Hodges PW, Dobson FL, Hinman RS (2014). What do people with knee or hip osteoarthritis need to know? An international consensus list of essential statements for osteoarthritis. *Arthritis Care and Research* 67: 809–16.

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8. If there is a lack of muscular strength, then the physiotherapist should provide muscle-strengthening exercises.

Is this indicator applicable?

☐ Yes      ☐ No, because...

Numerator: The number of patients with hip and knee osteoarthritis and lack of muscular strength who have been treated during the previous 12 months in whom muscle-strengthening exercises are provided.

Denominator: The total number of patients with hip and knee osteoarthritis and lack of muscular strength who have been treated during the previous 12 months.

Fransen M, McConnell S, Harmer AR, van der Esch M, Simic M, Bennell KL (2015). Exercise for osteoarthritis of the knee. *Cochrane Database of Systematic Reviews*;1: CD004376.

Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S (2014). Exercise for osteoarthritis of the hip. *Cochrane Database of Systematic Reviews*;4: CD007912.

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9. If the aerobic capacity is decreased, then the physiotherapist should provide exercise therapy to improve the aerobic capacity.

Is this indicator applicable?

☐ Yes      ☐ No, because...

Numerator: The number of patients with hip and knee osteoarthritis and decreased aerobic capacity who have been treated during the previous 12 months in whom exercises to improve the aerobic capacity are provided.

Denominator: The total number of patients with hip and knee osteoarthritis and decreased aerobic capacity who have been treated during the previous 12 months.

Fransen M, McConnell S, Harmer AR, Van der Esch M, Simic M, Bennell KL (2015). Exercise for osteoarthritis of the knee. *Cochrane Database of Systematic Reviews* 1: CD004376.

Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S (2014). Exercise for osteoarthritis of the hip. *Cochrane Database of Systematic Reviews* 4: CD007912.

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10. The physiotherapist should provide functional exercises aimed at specific individualized tasks.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months in whom functional exercises to improve specific individualized tasks are provided.

Denominator: The total number of patients with hip and knee osteoarthritis and decreased aerobic capacity who have been treated during the previous 12 months.

Expert opinion

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11.If a patient underwent joint replacement surgery, then the physiotherapist should provide at least muscle strengthening exercises and functional exercises aimed at specific individualized tasks.

Is this indicator applicable?

☐ Yes      ☐ No, because...

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months after joint replacement surgery in whom strengthening exercises and functional exercises to improve specific individualized tasks are provided.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months after joint replacement surgery.

Minns Lowe CJ, Barker KL, Dewey ME, Sackley CM (2009). Effectiveness of physiotherapy exercise following hip arthroplasty for osteoarthritis: A systematic review of clinical trials. *BMC Musculoskeletal Disorders* 10: 98.

Minns Lowe CJ, Barker KL, Dewey M, Sackley CM (2007). Effectiveness of physiotherapy exercise after knee arthroplasty for osteoarthritis: Systematic review and meta-analysis of randomised controlled trials. *BMJ* 335: 812.

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12.If there is severe pain and a reversible limitation in range of motion of the joint, then the physiotherapist should provide a combination of active exercise therapy and passive exercise therapy such as stretching, range of motion exercises and manual therapy.

Is this indicator applicable?

☐ Yes      ☐ No, because...

Numerator: The number of patients with hip and knee osteoarthritis, severe pain and a reversible limitation in range of motion of the joint who have been treated during the previous 12 months, in whom a combination of active exercise therapy and passive exercise therapy (such as stretching, range of motion exercises and manual therapy) is provided.

Denominator: The total number of patients with hip and knee osteoarthritis, severe pain and a reversible limitation in range of motion of the joint who have been treated during the previous 12 months.

Hoeksma HL, Dekker J, Runday HK, Heering A, van der Lubbe N, Vel C, Breedveld FC, van den Ende CH (2004). Comparison of manual therapy and exercise therapy in osteoarthritis of the hip: A randomized clinical trial. *Arthritis and Rheumatism* 51: 722–9.

Hoeksma HL, Dekker J, Runday HK, Breedveld FC, van den Ende CH (2005). Manual therapy in osteoarthritis of the hip: Outcome in subgroups of patients. *Rheumatology* 44: 461–4.

Vaarbakken K, Ljunggren AE (2007). Superior effect of forceful compared with standard traction mobilizations in hip disability? *Advances in Physiotherapy* 9: 117–28.

Pollard H, Ward G, Hoskins W, Hardy K (2008). The effect of a manual therapy knee protocol on osteoarthritic knee pain: A randomised controlled trial. *Journal of the Canadian Chiropractic Association* 52: 229–42.

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13.If there is patello-femoral osteoarthritis, then the physiotherapist should provide a combination of taping and functional exercises aimed at specific individualized tasks.

Is this indicator applicable?

☐ Yes      ☐ No, because...

Numerator: The number of patients with patella-femoral osteoarthritis who have been treated during the previous 12 months in whom a combination of taping and functional exercises aimed at specific individualized tasks is provided.

Denominator: The total number of patients with patella-femoral osteoarthritis who have been treated during the previous 12 months.

Warden SJ, Hinman RS, Watson MA Jr, Avin KG, Bialocerkowski AE, Crossley KM (2008). Patellar taping and bracing for the treatment of chronic knee pain: A systematic review and meta-analysis. *Arthritis and Rheumatism* 59: 73–83.

Quilty B, Tucker M, Campbell R, Dieppe P (2003). Physiotherapy, including quadriceps exercises and patellar taping, for knee osteoarthritis with predominant patello-femoral joint involvement: Randomized controlled trial. *Journal of Rheumatology* 30: 1311–17.

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14. The physiotherapist should motivate and stimulate the patient to do recreational physical activities in order to maintain an adequate and healthy level of physical functioning.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months who are motivated and stimulated to do recreational physical activities in order to maintain an adequate and healthy level of physical functioning.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.

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Expert opinion

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15. The physiotherapist should evaluate treatment by using a questionnaire recommended in the physiotherapy guideline for hip and knee osteoarthritis.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months in whom a recommended questionnaire to evaluate treatment is used.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.

de Groot IB, Reijman M, Terwee CB, Bierma-Zeinstra SM, Favejee M, Roos EM, Verhaar JA (2007). Validation of the Dutch version of the Hip disability and Osteoarthritis Outcome Score. *Osteoarthritis Cartilage* 15:104–9.

de Groot IB, Favejee MM, Reijman M, Verhaar JA, Terwee CB (2008). The Dutch version of the Knee Injury and Osteoarthritis Outcome Score: A validation study. *Health and Quality of Life Outcomes* 6: 16.

Beurskens AJ, de Vet HC, Koke AJ, Lindeman E, van der Heijden GJ, Regtop W, Knipschild PG (1999). A patient-specific approach for measuring functional status in low back pain. *Journal of Manipulative and Physiological Therapeutics* 22: 144–8.

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16. The physiotherapist should evaluate treatment by using a performance-based test recommended in the physiotherapy guideline for hip and knee osteoarthritis.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months in whom a recommended performance-based test to evaluate treatment is used.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months.

Dobson F, Hinman RS, Roos EM, Abbott JH, Stratford P, Davis AM, Buchbinder R, Snyder-Mackler L, Henrotin Y, Thumboo J, Hansen P, Bennell KL (2013). OARSI recommended performance-based tests to assess physical function in people diagnosed with hip or knee osteoarthritis. *Osteoarthritis and Cartilage* 21: 1042–52.

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17. In using a recommended measurement instrument to evaluate physiotherapy treatment outcome, there should be an improvement of at least 20%.

Numerator: The number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months in whom an improvement of at least 20% is achieved, measured using an instrument recommended in the physiotherapy guideline.

Denominator: The total number of patients with hip and knee osteoarthritis who have been treated during the previous 12 months after joint replacement surgery.

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Expert opinion

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A national survey was conducted amongst Belgian physiotherapists (n= 284) to measure their adherence to knee OA care (Spitaels et al., 2017). This survey contained nine QIs for knee OA management and a list of commonly used interventions (including acupuncture, balneotherapy, massage, taping, thermotherapy, and various electrotherapy modalities) that did not contribute to high quality care or were only recommended as adjunctive treatments. The nine QIs were part of the 21 QIs developed

from a Rand-modified Delphi method, where a multidisciplinary expert panel (n= 15) was recruited to rate recommendations extracted from seven knee OA guidelines and existing QIs. The panel comprised rheumatologists, orthopaedic surgeons, specialists in physical and rehabilitation medicine, general practitioners and physiotherapists working in various clinical settings, from across Flanders (Grypdonck et al., 2014). Of the 21 QIs, only nine were deemed to be applicable to physiotherapy management and they were related to OA education, weight loss, exercise, individualised programs, self-management strategies, follow-up, and community referral (Table 2.6). The responses to the QIs were measured using a Likert scale, where the response options included ‘never’, ‘sometimes’, ‘usually’ and ‘always’. The score ‘0’ was allocated to the answers ‘never’ and ‘sometimes’, and ‘1’ point score to ‘usually’ and ‘always’.

**Table 2.6 Quality indicators used to measure Belgian physiotherapists’ adherence to recommendations from clinical guidelines for knee OA. Taken from Spitaels et al. (2017).**

| Quality indicators for knee osteoarthritis |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                                         | If a patient has knee osteoarthritis, he should be given information access and education about the objectives of treatment and the importance of changes in lifestyle, exercise, pacing of activities, weight reduction and other measures to unload the damaged joints. <ul style="list-style-type: none"> <li>○ Education about the use of devices (cane, stick, ...)</li> <li>○ Education about the importance of weight loss</li> <li>○ Education about the importance of exercises/moving</li> <li>○ Advice on appropriate footwear and bracing</li> </ul> |
| 2.                                         | If a patient with knee osteoarthritis is overweight, then he should be encouraged to lose weight and maintain his weight at a lower level.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 3.                                         | a. If a patient has knee osteoarthritis, then exercise therapy should be prescribed, including at least muscle strengthening, aerobic exercises, and functional exercises. <ul style="list-style-type: none"> <li>○ Aerobic exercises</li> <li>○ Functional exercises</li> <li>○ Strength training</li> </ul> b. If a patient has knee osteoarthritis, the exercise therapy has to be combined with range-of-motion exercises in case of range-of-motion restrictions.                                                                                           |
| 4.                                         | If a patient with knee osteoarthritis is following exercise therapy, then the content and intensity of the exercise program should be tailored to the patients’ individual goals in terms of limitations of activity and restrictions of participation.                                                                                                                                                                                                                                                                                                          |
| 5.                                         | If a patient with knee osteoarthritis is following exercise therapy, then the exercise therapy should be combined with education/self-management interventions to improve patients’ mental and physical performance to alleviate pain.                                                                                                                                                                                                                                                                                                                           |
| 6.                                         | If a patient has symptomatic knee osteoarthritis, then he has to be referred to a physical therapist for instruction of the patient in appropriate exercises, for motivation of the patient to implement exercise and adhere to exercise and to evaluate the performance.                                                                                                                                                                                                                                                                                        |
| 7.                                         | If a patient with knee osteoarthritis is following exercise therapy, then the treatment sessions should be spread over longer periods with lower frequencies in the later stages of the exercise program to facilitate the transition from exercise therapy to independent exercising and maintaining sufficient level of physical activity.                                                                                                                                                                                                                     |
| 8.                                         | If a patient with knee osteoarthritis is following exercise therapy, then regular evaluations by the physiotherapist are necessary. To make the switch-over from a supervised to an autonomous program an evaluation session should be performed every three months in the first year, every six months in the second year and once a year afterwards.                                                                                                                                                                                                           |
| 9.                                         | If a patient with knee osteoarthritis is following exercise therapy, then he should be referred to regular community and sports activities after a period of supervised exercise.                                                                                                                                                                                                                                                                                                                                                                                |

A strength of the Belgian study was that it developed QIs pertaining to treatment strategies that did not contribute to high quality care for OA. However, the study used QIs that were generic and not specifically tailored to assess physiotherapy care for knee OA (Grypdonck et al., 2014). The study did not test the clinimetric properties of the QIs, so their reliability and validity were not determined. However, as a multidisciplinary expert panel was involved in the development of the QIs, they were deemed important and acceptable to health professionals. The QIs were also feasible for use by physiotherapists to assess their care for people with knee OA and were measurable based on their scoring system.

Table 2.7 summarizes the key features and limitations of the existing QI tools for physiotherapy care of hip and/or knee OA.

**Table 2.7 A summary table identifying the key features and limitations of the existing QI tools for physiotherapy care of hip and/or knee osteoarthritis.**

| Studies with OA QI tools for physiotherapists | Key features                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Limitations                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Jansen et al., 2010                           | <ul style="list-style-type: none"> <li>The first author drafted the QI tool based on key recommendations from the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Vogels et al., 2003).</li> <li>17 QIs, 3 related to OA diagnosis, 6 focused on treatment strategies and 8 were based on the treatment outcomes.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>No consensus method used for QI development.</li> <li>No clinimetric properties testing conducted.</li> <li>Lacked QI items pertaining to weight loss management.</li> <li>Contained QI items that had conflicting evidence to support their use (such those relating to massage and electrotherapy).</li> </ul>     |
| Peter et al., 2013                            | <ul style="list-style-type: none"> <li>The first author drafted the QIs based on the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Peter et al., 2011).</li> <li>Co-authors of the clinical guidelines reviewed the QIs.</li> <li>An expert panel of physiotherapists prioritised QIs that were the most relevant for physiotherapy practice.</li> <li>The QIs were pilot tested amongst clinical physiotherapists and researchers with expertise in medical education to improve clarity and completeness.</li> <li>18 QIs, 2 related to OA diagnosis, 12 focused on treatment strategies, and 4 associated with treatment evaluation.</li> <li>Clinimetric properties testing showed the QI tool to have acceptable test-retest reliability and moderate internal consistency.</li> </ul> | <ul style="list-style-type: none"> <li>Systematic consensus methods were not used for QI development.</li> <li>A self-reported QI tool that could result in reporting bias.</li> </ul>                                                                                                                                                                      |
| Peter et al., 2016                            | <ul style="list-style-type: none"> <li>The research team drafted the QIs from the Dutch clinical guidelines for physiotherapy in patients with hip and knee OA (Peter et al., 2011).</li> <li>Utilisation of the Appraisal of Guidelines for Research and Evaluation II tool to guide QI development.</li> <li>A multidisciplinary expert panel participated in an online 2 staged-Delphi survey to prioritise QIs that were most relevant to physiotherapy practice and to provide comments.</li> <li>17 QIs, each with relevant literature references or stated as based on expert opinion.</li> <li>QI passing rate calculated based on the numerator and denominator provided.</li> </ul>                                                                                                                               | <ul style="list-style-type: none"> <li>Contained QI items that had conflicting evidence to support their use (such as taping and manual therapy).</li> <li>No clinimetric properties testing conducted.</li> <li>QI tool not developed with an international perspective as only a national group of experts was recruited for the Delphi panel.</li> </ul> |
| Spitaels, Hermens, et al., 2017               | <ul style="list-style-type: none"> <li>9 QIs related to OA education, weight loss, exercise, individualised programs, self-management strategies, follow-up, and community referral.</li> <li>Contained QIs related to treatment strategies that did not contribute to high quality care for OA (such as acupuncture, balneotherapy, etc).</li> <li>The 9 QIs were part of QIs developed from a Rand-modified Delphi method, where a multidisciplinary expert panel was recruited to rate recommendations from 7 knee OA guidelines and existing QIs.</li> </ul>                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>No clinimetric properties testing conducted.</li> <li>QIs were generic and not specifically tailored to assess physiotherapy care for knee OA.</li> </ul>                                                                                                                                                            |

OA: Osteoarthritis; QI: Quality indicators.

Given the absence of a patient-reported QI tool to specifically assess physiotherapy care for hip and knee OA, Study Two in this thesis will develop such a tool and evaluate its clinimetric properties.

## 2.7 Provision of care to people with osteoarthritis

There is currently no cure for OA, so OA is best managed with first line treatments such as education regarding self-management, exercise and weight loss (for people who are

overweight or have obesity), with surgery indicated only when first line treatments have been exhausted (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018). Recent evidence suggests that management of patients presenting with OA is suboptimal and not all care provided to patients is in line with guideline recommendations (Basedow & Esterman, 2015; Runciman et al., 2012). The section below will review the current care for this patient population and outline the key barriers to delivering and engaging with OA care.

### ***2.7.1 Evidence-practice gaps in osteoarthritis care***

Management of OA typically involves a variety of health care providers, including general practitioners, medical specialists, and allied health professionals. To date, evidence suggests that people with OA do not receive high-quality care from their health providers. According to the CareTrack study, of 3517 primary care encounters in 2009-10, only 43% (95% CI, 35.8 to 50.5) of Australians with OA received appropriate care (Runciman et al., 2012). Internationally, a systematic review and meta-analysis of QIs in fourteen high-quality studies (sample population ranged between 320-21657) showed comparable findings, where only 36.1% (95% CI, 27.8 to 44.7) of patients with OA received non-drug treatments (Basedow & Esterman, 2015); however, it is worth noting that these data were from different health systems in various care settings and across different patient populations of varying disease severity (Basedow & Esterman, 2015). Similarly, another systematic review and meta-analysis of community-based OA care (15 observational studies, n= 16103) found poor pass rates for QIs relating to referral/recommendation to exercise (38.7%, 95% CI, 28.9 to 49.5) and offering of education regarding self- management (35.4%, 95% CI, 27.8 to 44.0) (Hagen et al., 2016).

When it comes to general practitioners' management of OA, the Bettering the Evaluation and Care of Health (BEACH) study found that pharmacological treatments were used for approximately 86% of patients with OA, and only 17% were referred for lifestyle management (Brand et al., 2014). A survey with general practitioners following the release of the RACGP guideline for hip and knee OA management found that non-pharmacological treatments such as exercise continued to be under-utilised despite guideline recommendations supporting their use. Almost all general

practitioners (96%) chose to prescribe paracetamol or the compound paracetamol/codeine medications for OA management and only 56% recommended one or two non-pharmacological treatments (Basedow, Williams, et al., 2015). Similarly, when managing people with foot/ankle OA, general practitioners less frequently implemented non-pharmacological treatments such as education, dietary advice, exercise, and referral to allied health professionals (K. L. Paterson et al., 2018).

The management of OA amongst other health professionals is also suboptimal. A study looking at podiatrists and physiotherapists' management of first metatarsophalangeal (MTP) joint OA found that various assessment and treatment approaches were utilised for OA management despite limited evidence to support their clinical utility (Kade L. Paterson et al., 2020). For example, both podiatrists and physiotherapists reported favouring the use of imaging as part of their assessment (Kade L. Paterson et al., 2020) despite its limited role in the OA diagnosis (NICE, 2014; Sakellariou et al., 2017).

Amongst patients with OA, the uptake of non-pharmacological treatments for their condition was generally low. A population survey of 4059 patients with OA in the UK found that overall, the uptake of non-pharmacological treatments was considerably lower than pharmacological treatments. Up to 40% of patients reported using paracetamol for their OA management and only 13.1% utilised muscle strengthening exercises (Healey et al., 2018). Similarly, a survey with Norwegians who had OA found that the overall pass rate (numerator equated to the number of indicators passed and the denominator equated to the number of eligible persons) for pharmacological treatments was higher (53%) compared with non-pharmacological management (44%) (including physical activity, education on OA development and treatment, advice on self-management and lifestyle, and weight loss support) (Gronhaug et al., 2014). A study of Australians with hip or knee OA who had moderate pain and physical dysfunction (n=591) found that up to 79% reported having never tried exercise such as hydrotherapy, muscle strengthening and aerobic exercise. Although half of the participants attempted to lose weight as part of their OA management plan, very few (6-18%) engaged in an exercise program. Other non-pharmacological treatments such as shoe orthoses, thermal therapy, walking aids and electrotherapy were also infrequently utilised

(Hinman et al., 2015). Overall, studies suggest that there continues to be evidence-practice gaps in OA care, both in Australia and globally.

### ***2.7.2 Barriers to delivering high-quality OA care***

A scoping review of 69 studies identified two types of barriers to guideline implementation amongst health professionals, including personal and guideline-related factors (Fischer et al., 2016).

Personal factors relate to clinician's knowledge, skills, and attitudes towards the disease management. A systematic review of the barriers to the management of OA found that primary care practitioners (general practitioners, practice nurses, pharmacists, physiotherapists) generally perceived themselves to be under-prepared in terms of knowledge to manage patients with OA. Many were unfamiliar with treatment recommendations from the OA clinical guidelines. The clinicians' personal beliefs were also conflicting with the recommended care, and some general practitioners were influenced by patient expectations when managing OA (Egerton et al., 2017). Similarly, a study of Australian general practitioners' attitudes towards clinical guidelines found that most practitioners were unfamiliar or unaware of the existing OA guidelines established by the RACGP (Basedow et al., 2016). Previous studies also identified health professionals to lack skills and confidence when delivering OA care, particularly in supporting lifestyle interventions (Allison et al., 2019; Andrew M. Briggs et al., 2019; A. M. Briggs et al., 2019). Skills gaps in nutritional and weight management for patients with OA were identified amongst general practitioners, nurses, and physiotherapists (A. M. Briggs et al., 2019). Moreover, health professionals were found to adopt a strong biomedical approach to OA joint pain when completing the Pain Attitudes and Beliefs Biomedical Subscale (an outcome measure to evaluate clinicians' general attitudes towards musculoskeletal pain) (Andrew M. Briggs et al., 2019). This is not surprising considering OA is often viewed by health professionals as inevitable and a degenerative condition that can only worsen with age (Arthritis Australia, 2012; Egerton et al., 2017). This further explains why most general practitioners tended to prioritise pharmacological treatments when managing people with OA (Brand et al., 2014).

Several guideline-related barriers exist, and a key barrier arises when there is poor evidence available or contradictions exist amongst different clinical guidelines (Fischer et al., 2016). For example, the use of acupuncture, knee braces, heel wedges, intra-articular hyaluronans, and glucosamine/chondroitin in the management of OA remains controversial (Amanda E. Nelson et al., 2014) and this discrepancy could be possibly due to a lack of standardised and appropriate methodology to develop clinical guidelines (R. D. Altman et al., 2015). Another criticism of guidelines is that they typically focus on patients with single disease and are not readily applicable to the ‘typical’ patient presenting in clinical practice (Fischer et al., 2016). Indeed, some general practitioners reported having difficulties applying guidelines into practice, particularly if the recommendations did not consider individual circumstances, such as those with co-morbidities (Basedow et al., 2016). Osteoarthritis guidelines do not typically give explicit guidance to clinicians on how to adapt recommendations for patients who present with comorbidities. Moreover, many studies that were included in clinical guidelines often excluded patients with comorbidities (Ferreira de Meneses et al., 2016).

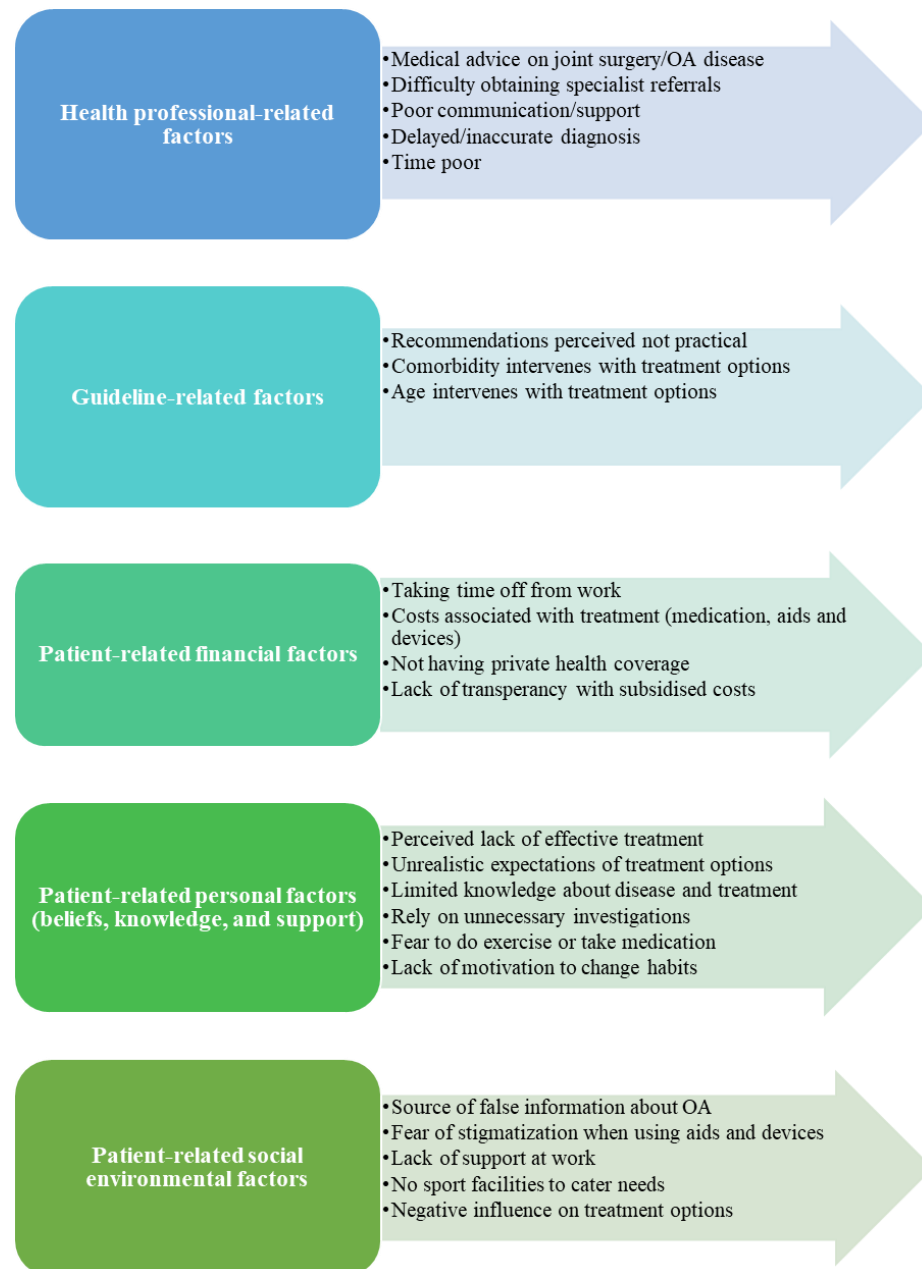
Clinicians also struggle to implement guideline recommendations because of a multitude of reasons including guideline complexity, poor layout as well as limited guideline accessibility and applicability to clinical practice (Fischer et al., 2016). A study of general practitioners found that doctors preferred shorter clinical practice guidelines format (i.e. ≤three pages of summaries, flow charts, algorithms and single-page checklists) and electronic versions that were easily accessible (Basedow et al., 2016).

Study Three will explore experiences of physiotherapists delivering care for people with knee OA, along with the barriers they encounter when delivering evidence-based care.

### ***2.7.3 Barriers to engaging with high-quality OA care***

While the previous section looked at barriers to clinicians delivering high quality care, this section will summarise the barriers from the patient’s perspective. Barriers to engaging with high-quality OA care include health professional-related, guideline-

related, and patient-related personal, financial and social environmental factors (Figure 2.13) (Ackerman et al., 2016; Spitaels, Vankrunkelsven et al., 2017).



**Figure 2.13 Key barriers to engaging with osteoarthritis care, synthesized, and taken from Ackerman et al. (2015) and Spitaels, Vankrunkelsven et al. (2017).**

The first barrier to engaging with OA care relates to health professional-related factors. Semi-structured interviews with 33 Australians who had hip and knee OA found that patients were often advised by their general practitioners or medical specialists to avoid joint replacement surgery and to persevere with their OA condition, with minimal treatment options offered (Ackerman et al., 2016). According to the 2011 Voice of Arthritis consumer survey, four in five patients who rated themselves as being most affected by their condition felt that their general practitioners were unequipped with knowledge of treatments for arthritis (Arthritis Australia, 2011). Similarly, a narrative review of 22 international studies exploring patient experiences of consulting general practitioners for their OA found that patients often received an 'OA' diagnosis late with the 'wear and tear' label conveyed to them instead. They were informed by their doctors that OA was normal for their age and that little could be done. Patients were also dissatisfied with their doctors for providing them with insufficient OA information or an explanation of the condition and self-management strategies (Paskins et al., 2014).

Personal barriers include patients' belief, expectations and knowledge about OA (Ackerman et al., 2016; Spitaels, Vankrunkelsven et al., 2017). A Belgian qualitative study with eleven patients who had knee OA found that some patients seemed to have limited knowledge about OA and its associated treatment options and would often request imaging to confirm their diagnosis. Patients with comorbidities would prioritise other conditions over OA when consulting their doctors. They also found it difficult to understand the importance of non-surgical treatments for OA and chose to cease their exercise and pain medications due to fear of pain and addiction respectively (Spitaels, Vankrunkelsven et al., 2017). In Australia, a qualitative study with 27 patients waiting for knee joint replacement showed that patients commonly thought of OA as being 'bone on bone' and caused by 'wear and tear'. They also believed that exercise further damaged their joint and they expected pain to worsen over time. Many of them preferred surgical treatments to 'replace' lost cartilage and to 'cure' their pain (Bunzli et al., 2019).

Another barrier to engaging with OA care relates to financial factors. Semi-structured interviews with 33 Australians who had hip and knee OA found some of the financial barriers patients experienced include having difficulty taking time off work for medical

appointments, costs associated with treatments such as physiotherapy, and limited private health coverage for specialist's consultation (Ackerman et al., 2016). Guideline-related barriers to engaging with OA care include patients perceiving clinical guideline recommendations to be impractical or not applicable particularly to people with comorbidities or of younger age. The Belgian qualitative study with patients who had knee OA (Spitaels, Vankrunkelsven et al., 2017) found that patients with additional comorbidities such as heart or lung diseases found it challenging to do exercise or participate in physical activity as recommended by the clinical guidelines. Some patients reported not being able to undergo joint replacement due to their age, especially those who were deemed 'too young' to have one. This was also evident in the qualitative study with Australians waiting for knee joint replacement, where younger patients described feeling despair at being left to 'sit and wait' until they were old enough for surgery (Bunzli et al., 2019).

The social environment may also hinder patients from engaging with OA care. Patients generally perceived their social environment as an important source of OA information, although some of the information obtained was not evidence-based (Spitaels, Vankrunkelsven et al., 2017). A qualitative study with six focus groups (n= 37) in the United States found that patients' attitudes and beliefs towards knee joint replacement were largely based on their personal experiences and surgical encounters by relatives, friends, or acquaintances (Suarez-Almazor et al., 2010). Patients generally perceived aids and devices for OA as a form of social stigma and those who were still working often felt unsupported as there was lack of work modifications to suit their physical needs resulting from OA (Spitaels, Vankrunkelsven et al., 2017). A Dutch survey with 1002 people who had hip and/or knee OA found that although 30% of those who were working desired work adaptation to suit their OA needs, less than half of them followed through with the changes (Bieleman et al., 2010).

#### ***2.7.4 System or service-level barriers to OA care***

System or service-level barriers to OA care may include organisational limitations, restricted resources (including time constraint, heavy workload), inadequate funding, and poor access to home exercise equipment or OA information (Ackerman et al., 2016; Fischer et al., 2016; Spitaels, Vankrunkelsven et al., 2017). A multi-national survey

completed by primary care providers (n= 1886) and final year physiotherapy and medical students (n= 1611) revealed that workplace setting (e.g. clinical practice and workforce training issues, infrastructure limitations), health financing and system/service issues (e.g. inappropriate funding models, long waiting list for specialists and allied health review, inadequate clinicians in rural areas) were some of the key barriers to delivering OA care (A. M. Briggs et al., 2019).

Similarly, the Voice of General Practitioners on Arthritis survey identified key barriers to high quality OA care including limited access to allied health professionals and specialists and their associated costs, as well as inadequate government funding for this patient population (Arthritis Australia, 2012). The Chronic Disease Management initiative (funded through the Medicare scheme) only provides five allied health visits per year (Australian Government Department of Health, 2014) and is insufficient for multidisciplinary care required for OA management (Arthritis Australia, 2012).

According to the Voice of Arthritis consumer survey, Australians with arthritis also reported experiencing poor access to health care providers (general practitioners, specialists, allied health professionals such as physiotherapists) and arthritis treatment information (Arthritis Australia, 2011). A Canadian study with 20 urban and rural people diagnosed with OA found that rural patients particularly, had difficulty obtaining medical appointments and maintaining a general practitioner over the long term. They often resorted to using the local emergency department for OA care. Patients also described limited access to health care services, hindering them from receiving appropriate and timely OA care (Ali et al., 2018).

In light of evidence-based gaps identified in the literature, further research is needed to explore ways to support delivering of safe and high-quality care to people with OA in order to minimise unwarranted variation and improve patient outcomes.

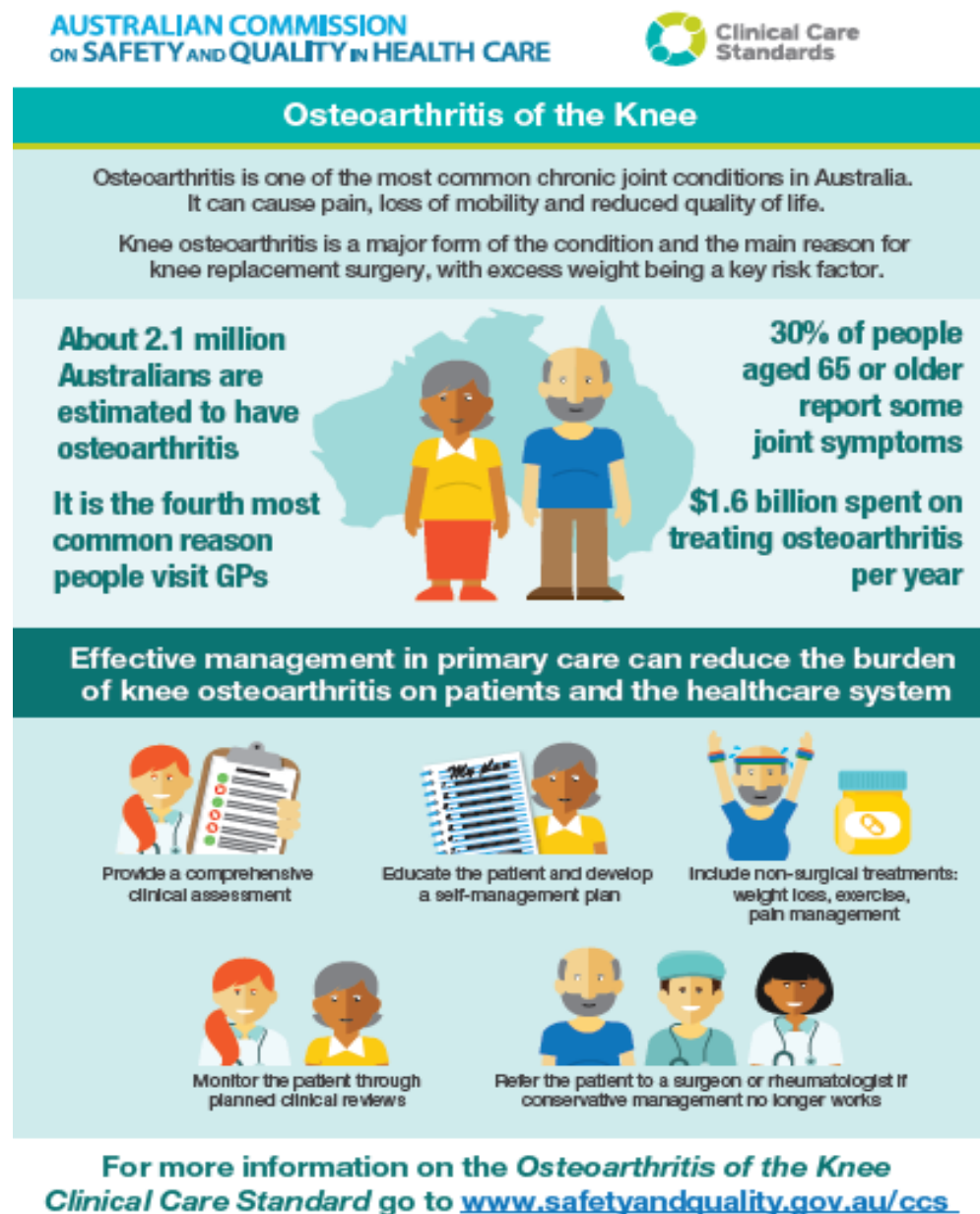
## **2.8 Australian Clinical Care Standard for knee OA**

The Australian Commission on Safety and Quality in Health Care established the Clinical Care Standard program to develop quality standards for discrete health conditions that would benefit from a national coordinated approach. A Clinical Care Standard is a set of nationally-agreed quality statements that describe key aspects of

care that patients should be offered for a given health condition. Each Clinical Care Standard also goes through a public consultation process prior to finalisation and publication (Australian Commission on Safety and Quality in Health Care, 2017).

The Clinical Care Standard for knee OA was published in 2017 (Figure 2.14) (Australian Commission on Safety and Quality in Health Care, 2017). It defines seven key aspects of care that people with knee OA should expect to receive in Australia. The quality care standard expects a comprehensive assessment to include subjective and physical assessments, as well as an evaluation of psychosocial factors that may impact people with knee OA. Knee OA should be diagnosed clinically, and imaging is indicated only for any alternative diagnosis. Patients should be informed about OA and treatments options and offered an individualised self-management plan. Patients who are overweight or have obesity should be provided with support to lose weight as well as to establish weight and exercise goals. In addition, patients with knee OA should be provided with medication advice for symptoms management and regular clinical reviews. For patients with worsening knee OA symptoms, severe functional impairments and who have responded poorly to conservative management, referral for specialist assessment and provision of appropriate information to make an informed decision are warranted. Moreover, if surgery is indicated and preferred, patients should be offered timely joint conserving or replacement surgery. Finally, arthroscopic surgery should only be offered to those with true mechanical knee locking (Australian Commission on Safety and Quality in Health Care, 2017).

Clinicians and/or health services can use the OA of the knee Clinical Care Standard for quality assessment (Australian Commission on Safety and Quality in Health Care, 2017) by assessing their clinical performance against the clinical care standard. It is currently unknown if the experiences of Australian physiotherapists and patients delivering and receiving care for knee OA align with the national Clinical Care Standard for knee OA. Such information is important for identifying and understanding gaps that are impacting quality of physiotherapy care and may help inform strategies to support practice improvement.



**Figure 2.14 Infographic for osteoarthritis of the knee Clinical Care Standard. Taken from the Australian Commission on Safety and Quality in Health Care website (2019).**

## **2.8 Quality of physiotherapy care for people with osteoarthritis**

Physiotherapists are important providers of care, given the central role of conservative strategies such as exercise for managing OA. Thus far, there are indications that there is variation in the care provided by physiotherapists to people with OA. Several studies investigated the quality of physiotherapy care for people with hip and/or knee OA, both

from the physiotherapists' and patients' perspectives. Many of these studies were quantitative in nature, where surveys and questionnaires were used to investigate physiotherapy management for people with this condition.

Quantitative research may provide valid and reliable measurement of care provided by physiotherapists but does not seek to understand the subjective and personal experiences of individuals (Smith et al., 2018). On the contrary, qualitative research is used to examine in-depth the attitudes, experiences, and behaviours of individuals and allow for understanding and knowledge to be built through active experience and interpretation (Baxter et al., 2008; Smith et al., 2018). This research design can shed light on aspects of physiotherapy care that cannot be assessed via quantitative methods. Such information is important for identifying and understanding gaps that are impacting quality of physiotherapy care and may help inform strategies to support practice improvement. Therefore, a qualitative method is used in Study Three and Four of this thesis. The following section will outline both quantitative and qualitative studies that specifically investigated physiotherapy care for people with hip and/or knee OA from physiotherapists' perspectives and describe the current gaps in literature.

### ***2.8.1 Quality of physiotherapy care for people with hip and/or knee osteoarthritis - the physiotherapists' perspective***

#### *Quantitative studies*

Several quantitative studies have been conducted with physiotherapists to investigate their management of people with hip and/or knee OA. A cross-sectional survey with 413 physiotherapists in Florida found that most participants perceived therapeutic exercise and education as effective or very effective for people with knee OA and reported using these interventions often (da Costa, Vieira, et al., 2017). Older physiotherapists (>60 years) were more likely to use passive treatments (such as ultrasound, electrotherapy, kinesiology tape and ice therapy) for knee OA management. A Canadian study with 388 physiotherapists also found that most physiotherapists reported providing leg strengthening exercises and education to people with knee OA (Tittlemier et al., 2020). In addition, private practice physiotherapists were more inclined to use hands on treatment (including acupuncture, mobilization, and manipulation) for people with knee OA than those working in hospital settings.

Although both studies investigated the association between physiotherapists' characteristics and their clinical decision-making for OA management, the rationale behind such decision-making process was not explored, making it difficult to understand why certain treatments were favoured over others. In addition, both studies used closed questions for their surveys, so participants were not provided with opportunities to justify their responses. Such information is important for understanding the causes of the gaps that are impacting quality of physiotherapy care for OA management.

In Belgium, QIs were used to measure 284 physiotherapists' adherence to clinical guideline recommendations for knee OA. This study showed varied compliance rates (Spitaels et al., 2017). Although physiotherapists scored above 80% for providing personalized exercise education and prescription and for referring patients to sports activities following their physiotherapy sessions, the compliance for providing education about weight loss, self-management strategies, long-term follow up and regular reviews was below 50%. The study used a self-reported questionnaire, which could result in reporting bias as physiotherapists might have responded to the survey questions in a socially desirable manner. Although quantitative research using QIs can provide measurable data to evaluate clinical performance, it does not provide information about why there was a discrepancy in care and the potential barriers to implementing OA guideline recommendations amongst physiotherapists.

A study with 1148 physiotherapists in the UK found that most physiotherapists commonly provided a range of treatments such as advice, exercise (strengthening and general physical activity), and other non-drugs treatments (including manual therapy and gait retraining) to people with hip OA (Holden et al., 2018). These findings are similar to two previous UK studies with 1152 and 83 physiotherapists respectively (Holden et al., 2008; Walsh et al., 2009), exploring their management of knee OA. Both studies identified that the most common treatments for knee OA included advice, and adjunctive treatments such as thermotherapy, electrotherapy, manual therapy, and acupuncture. An Australian survey (n= 222) investigating physiotherapy management of hip OA also found that treatments such as strengthening exercises, manual therapy and electrotherapy were offered to people with hip OA (Cowan et al., 2010). Most of

the treatments used in all four studies align with clinical guideline recommendations (Bannuru et al., 2019; Kolasinski et al., 2020; NICE, 2014; Royal Australian College of General Practitioners, 2018), however, there is indication that physiotherapists in these studies seemed to adopt a biomedical approach in OA management. For instance, patient education in the UK studies predominantly focused on pacing of activities and the need to rest or avoid aggravating activities (Holden et al., 2018; Holden et al., 2008; Walsh et al., 2009), implying an attempt to address the ‘mechanical’ aspects of OA progression. Physiotherapists in all four studies also tended to use passive treatments to manage OA symptoms such as pain and stiffness. Nevertheless, these assumptions are made based on the physiotherapists’ responses to closed questions used in all four studies. Moreover, three of these studies were conducted more than a decade ago, so findings may not reflect current physiotherapy practice. This further highlights the need for qualitative studies to explore in-depth current physiotherapists’ experiences in managing OA.

### *Qualitative studies*

So far, three studies utilised qualitative research designs to explore physiotherapy management of knee OA. The first was a mixed method study (Holden et al., 2009), conducted in the UK with 1152 physiotherapists to explore their attitudes towards exercise recommendations for people with knee OA. Twenty-four physiotherapists underwent semi-structured interviews. Findings included that physiotherapists perceived exercise adherence as important but felt that it was the sole responsibility of the patients to adhere to the exercises they prescribed. The physiotherapists also described a biomedical approach to managing knee OA, associating knee OA with ‘wear and tear’, and perceiving it as a chronic degenerative condition. In addition, they focused on the signs and symptoms of knee OA and believed that pain was due to tissue/structural damage. They also highlighted several barriers to optimal management of OA, including busy caseloads, long waiting list, limited follow ups and difficulty transitioning patients to community facilities for long-term support. Findings from this study help explain the biomedical approach that was evident in previous quantitative studies and identify barriers to delivering high-quality care to people with OA. However, this study was conducted over a decade ago so findings may not reflect

current physiotherapy practice. Besides, approximately 71% of physiotherapists invited for the interviews declined to participate, so findings may not reflect opinions of those who declined participation.

A recent Canadian study (n= 33) used semi-structured interviews to explore physiotherapy management of people with early knee OA in community or outpatient settings (MacKay et al., 2020). The study found that physiotherapists relied on treatment strategies that could help improve knee symptoms and their treatment approach was typically based on their previous clinical experience and ongoing learning from professional development courses. Physiotherapists described being equipped with a 'toolbox' of interventions that could be tailored to suit patients' needs. The 'toolbox' included exercise, manual therapy, education, braces, and taping. Exercise and physical activity were central to management of knee OA, but when it came to weight loss management, some physiotherapists felt uncertain and less confident to address it. Findings were similar to a recent Australian qualitative study (n= 18) exploring how outpatient physiotherapists in metropolitan Victoria applied clinical guidelines when managing people with knee OA (Tang et al., 2020). The study found that whilst physiotherapists were most confident to prescribe range of movement and strengthening exercise as part of knee OA management, they felt unequipped to offer aerobic exercise and weight management strategies. They also perceived medication and weight loss advice to be outside of their scope of practice. The Canadian study only recruited local physiotherapists so findings may not apply to physiotherapists from other countries. The Australian study recruited physiotherapists from Victoria only so findings may not reflect physiotherapy practice across the country.

Collectively, findings from the qualitative studies provide insight into physiotherapy management of knee OA. However, findings were predominantly focused on treatment strategies for knee OA, and little is known about the assessment and diagnosis of knee OA provided by physiotherapists. Comprehensive management of OA also includes patient education and self-management behaviours, referral to surgical opinions for patients who respond poorly to conservative treatments, and provision of regular reviews (Australian Commission on Safety and Quality in Health Care, 2017) but these

aspects of care were not explored in the studies described above. This is likely due to the limitations of interview schedules used in all studies. In addition, there has been no qualitative study conducted across Australia and given inherent differences in health professional training and health system structure across countries, we cannot necessarily generalise findings from other countries. Therefore, qualitative research to appraise physiotherapy care delivery for knee OA in Australia is warranted (Study Three of this thesis).

### ***2.8.2 Quality of physiotherapy care for patients with hip and/or knee osteoarthritis - patients' perspective***

It is equally important to explore patient experiences receiving physiotherapy care for their hip and/or knee OA because patients may have different expectations and preferences when seeking physiotherapy care for their condition, which can influence their response to physiotherapy management. In addition, recognising individual preferences and needs within the health care system is integral to achieving better patient outcomes. Patients often have different knowledge and experience in managing their own health conditions and can offer invaluable insights to research (INVOLVE, 2017). Currently, little is known about the experiences of people receiving physiotherapy care for their hip and/or knee OA. The sections below will summarise the available quantitative and qualitative studies relating to physiotherapy care for people with hip and/or knee OA from patients' perspectives and describe the current gaps in the literature.

#### *Quantitative studies*

A New Zealand study used a cross-sectional survey to explore patients' (n= 98) and medical practitioners' (n= 44) expectations and experiences of physiotherapy management for hip and knee OA (Reid, 2014). Most of the patients who had physiotherapy for their hip or knee OA believed that physiotherapy was an important part of their OA management and was helpful to improve their joint range of motion and muscle strength. Some would continue with their physiotherapy sessions for as long as possible, while a minority of them preferred joint surgery. For those who did not see a physiotherapist for their condition, most were unaware of the different treatments that physiotherapists could offer. They would, however, consider seeing one

if they had known of the benefits. Most also did not see a physiotherapist as their general practitioner or orthopaedic surgeon had not suggested it as an option for their OA management. Some patients reported treatment cost and the impression that physiotherapists would aggravate their pain as deterrents from seeing a physiotherapist. These findings provide insight into patients' beliefs, expectations, and experiences of receiving physiotherapy care for their OA management along with patient barriers to accessing or undertaking care. However, responses to the study survey were based on closed format questions, so it is difficult to ascertain why some patients felt the way they did and the rationale behind the decisions they made when seeking physiotherapy care for their OA management. A qualitative methodology is preferred to explore patients' experiences in managing OA, due to the rich depth of data generated, to enhance our understanding of patient expectations when seeking physiotherapy care for their condition.

### *Qualitative studies*

Thus far, no qualitative study specifically evaluates patient experiences with physiotherapy care for the management of hip and/or knee OA. Most qualitative studies investigated patient experiences receiving OA care from a range of healthcare professionals, which included physiotherapists. A small qualitative study in Belgium broadly explored patient experiences (n= 11) with current care received for knee OA (Spitaels, Vankrunkelsven et al., 2017). Patients felt that there was poor communication from medical professionals with limited consultation time given. Those who were referred to physiotherapists reported not receiving a strengthening program to improve their condition. Most patients expected imaging to confirm their OA diagnosis and did not recognize the importance of weight control or physical activity as part of their OA management. Medications and surgery were perceived to be the only treatment options for OA but there was some concern about their side effects. Patients were not keen on physical activity due to being time-poor and many stopped their physiotherapy due to experiencing pain, slow progress, or associated financial cost. As the study included patients who received OA care from various healthcare professionals, it is difficult to ascertain which treatment strategies were specifically provided by physiotherapists.

Although not specific to physiotherapy care, a systematic review of 26 qualitative studies explored the experiences of living with knee OA from patient (n= 665) and carer (n= 28) perspectives (Wallis et al., 2019). Amongst a range of findings, that review noted that people with knee OA had either positive or negative interactions with health professionals, including physiotherapists. Patients who had positive experiences appreciated being listened to and provided with hope for the future as well as strategies (such as weight loss advice and exercise) to manage their condition. Those with negative experiences described not being provided with sufficient information regarding their conditions or the management options available. They also experienced difficulties understanding the information provided to them and felt they were not being listened to or given enough attention during consultations. Although this review provides useful information about the factors influencing patient experiences with health care providers, it did not specifically explore patient experiences with physiotherapy care.

Collectively, both quantitative and qualitative research of OA care experiences from patients' perspectives show that patients had both positive and negative experiences seeing different health care professionals for knee OA management. Patients seemed to value interpersonal care provided by their clinicians and had certain expectations of what should be provided to them for their OA management. This included attaining imaging to confirm OA diagnosis as well as receiving exercise and OA information from the healthcare professionals. However, gaps in the literature remain with respect to experiences of people receiving physiotherapy care for their knee OA, demonstrating the need for further qualitative research in this area (Study Four of this thesis). Such information will help inform strategies to improve future care and service delivery.

## **2.9 Summary and aims of the thesis**

Hip and knee OA are highly prevalent and their impact on individuals and society is substantial. Non-surgical interventions such as exercise, weight loss for those who are overweight and have obesity, and self-management education remain the cornerstone of management for hip and knee OA. Physiotherapists are important providers of such care. As such, they have a professional responsibility to ensure that the care they provide to people with OA is safe and aligns with best practice.

Clinical guidelines for OA are often aimed at a variety of health care providers and it is often unclear whose responsibility it is to enact individual guideline recommendations. Two guidelines specific to physiotherapy management of people with OA have been previously published but one is now out of date (Peter et al., 2011) and the other is limited to hip OA only (Cibulka et al., 2017). There is also a lack of valid and reliable patient-reported QIs to assess physiotherapy care specifically for hip and/or knee OA. In addition, little is known about the experiences of Australian physiotherapists and patients delivering and receiving care for knee OA and if their reported experiences align with the national Clinical Care Standard for knee OA. Qualitative research is therefore needed to capture their experiences for knee OA to shed light on aspects of care that cannot be assessed via quantitative methods. Such information is important for identifying and understanding gaps that are impacting quality of physiotherapy care and may help inform strategies to support practice improvement.

Therefore, the aims of this thesis were to:

- 1) Identify and prioritize the most important clinical guideline recommendations relevant to physiotherapy practice for hip and/or knee OA;
- 2) Develop a patient-reported QI tool to evaluate physiotherapy care for people with hip and/or knee OA and to evaluate its clinimetric properties;
- 3) Explore the experiences of Australian physiotherapists delivering care for people with knee OA and investigate the degree to which the reported experiences align with the OA of the Knee Clinical Care Standard; and
- 4) Explore the experiences of people who had recently received physiotherapy care for their knee OA in Australia and investigate the degree to which the reported experiences align with the OA of the Knee Clinical Care Standard.

The specific aims of each individual study within this thesis will be described in the relevant chapter.

### **Chapter Three Identifying and prioritizing clinical guideline recommendations most relevant to physical therapy practice for hip and/or knee osteoarthritis**

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Author contributions for this chapter are the following: PLT, RSH, TE, KSD and KLB contributed to the study conception and design. PLT completed data collection. PLT, RSH, TE, KSD and KLB contributed to the data analysis and interpretation of data. PLT wrote the first draft of the manuscript. All authors revised the paper and provided scientific input. All authors approved the final version of the manuscript.

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The aim of this Chapter is to identify and prioritize the most important clinical guideline recommendations relevant to physiotherapy practice for hip and/or knee OA. The

findings will be used to develop a patient reported QI tool to evaluate physiotherapy care for people with these conditions (Chapter Four).

## [ RESEARCH REPORT ]

PEK LING TEO, BPhysio, MHSc<sup>1</sup> • RANA S. HINMAN, BPhysio (Hons), PhD<sup>1</sup> • THORLENE EGERTON, BPhy, PhD<sup>1</sup>  
 KRYSIA S. DZIEDZIC, GradDipPhys, PhD<sup>2</sup> • KIM L. BENNELL, BAppSci (Physio), PhD<sup>1</sup>

# Identifying and Prioritizing Clinical Guideline Recommendations Most Relevant to Physical Therapy Practice for Hip and/or Knee Osteoarthritis

**O**steoarthritis (OA) is a chronic condition that commonly affects the hip and knee joints, causing significant pain and disability in affected individuals.<sup>39</sup> Osteoarthritis at these lower-limb sites is the leading contributor to the burden of OA and is often treated with arthroplasty surgery.<sup>12</sup> The burden of OA on the health care system is anticipated to



exponentially increase, due to the aging population and rising obesity rate.<sup>4,5</sup> Core management of people with OA comprises exercises, self-management education, and weight loss.<sup>3,35,39</sup>

Physical therapists are thus a key provider of care for this patient population, given the central role of conservative strategies for managing OA.<sup>58,59</sup>

While evidence-based guidelines on the management of OA<sup>2,3,16,23,35,39</sup> exist, studies have indicated gaps between physical therapist practice and clinical guideline recommendations for hip and/or knee OA management.<sup>11,18,24,53</sup> A study among Belgian physical therapists showed that some continued to employ ineffective treatments for the management of knee OA.<sup>41</sup> An Australian cross-sectional survey also identified that some physical therapists used electrotherapy to manage people with hip OA,<sup>11</sup> despite insufficient evidence to support its use.<sup>3,39</sup> These findings suggest a shortfall in the dissemination and implementation of existing recommendations among physical therapists.

• **BACKGROUND:** Physical therapists are key providers of conservative management for hip and/or knee osteoarthritis (OA), yet not all guideline recommendations are tailored to their scope of practice.

• **OBJECTIVE:** To identify and prioritize the most important recommendations relevant to physical therapy practice for hip and/or knee OA.

• **METHODS:** International physical therapists (n = 132) were invited to participate in an online modified Delphi survey, followed by a priority-ranking exercise. A total of 63 recommendations were extracted from 2 recent high-quality clinical guidelines. In 3 Delphi rounds, the panel identified those recommendations they considered to be most relevant to physical therapy practice for hip and knee OA. Any new recommendations were ascertained. For a recommendation to be included, at least 70% of respondents had to rate the recommendation as 7 or above on a numeric rating scale (0 is not important and 10 is extremely important). The panel prioritized

recommendations that remained after the final round using decision-making software.

• **RESULTS:** Of 132 therapists from 14 countries, 62 completed round 1, 52 completed round 2, 45 completed round 3, and 35 completed the priority-ranking exercise. From an initial list of 70 potential recommendations (including 7 new recommendations), 30 were included in the priority-ranking exercise. The top recommendations were related to providing education and prescribing exercise and weight loss as core treatments, followed by individualized OA assessment and treatment and communication strategies.

• **CONCLUSION:** This study identified and ranked the most important recommendations relevant to physical therapy practice for hip and/or knee OA. *J Orthop Sports Phys Ther* 2019;49(7):501-512. doi:10.2519/jospt.2019.8676

• **KEY WORDS:** clinical practice, Delphi, evidence-based care, knowledge translation, priority ranking, quality indicators

<sup>1</sup>Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, Melbourne School of Health Sciences, The University of Melbourne, Parkville, Australia. <sup>2</sup>Arthritis Research UK Primary Care Centre, Research Institute for Primary Care and Health Sciences, Keele University, Keele, United Kingdom. The University of Melbourne Human Research Ethics Committee granted ethical approval for this study (Ethics ID 1750150). This work was supported by funding from the National Health and Medical Research Council (Centres of Research Excellence number 1079078). Ms Teo is supported by a PhD stipend scholarship from the Australian Government Research Training Program. Dr Hinman is supported by an Australian Research Council Future Fellowship (FT130100175), and Dr Egerton is funded by the Centres of Research Excellence and The University of Melbourne. Dr Dziedzic is partially funded by the Collaboration for Leadership in Applied Health Research and Care West Midlands and by a Knowledge Mobilisation Research Fellowship (KMRF 2014-03-002) from the National Institute for Health Research. Dr Bennell is supported by a National Health and Medical Research Council Research Fellowship (number 1058440). The funders had no role in the development of the study method, interpretation of the results, or reporting. The authors certify that they have no affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the article. Address correspondence to Dr Kim Bennell, Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, Level 7, Alan Gilbert Building, 161 Barry Street, The University of Melbourne, Parkville, VIC 3010 Australia. E-mail: k.bennell@unimelb.edu.au • Copyright ©2019 Journal of Orthopaedic & Sports Physical Therapy®

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Improving implementation of hip and knee OA guidelines within physical therapy practice could improve delivery of effective treatments and optimize treatment outcomes for patients. A preliminary step to assist physical therapists to adopt best practices, as outlined in hip and knee OA guidelines, is to identify and prioritize clinical guideline recommendations that are most relevant to physical therapy practice.

Physical therapy management of people with OA does not occur in isolation from other health care providers. Effective management of hip and knee OA typically involves a variety of health care providers, including general practitioners, rheumatologists, and orthopaedic surgeons, as well as a range of allied health professionals, and the role responsible for enacting individual guideline recommendations is often unclear. Furthermore, not all recommendations from current OA guidelines<sup>2,3,16,23,35,39</sup> are within the scope of physical therapy practice. Although 2 guidelines specific to physical therapy management of people with OA have been previously published, one is now out of date<sup>41</sup> and the other is limited to hip OA only.<sup>10</sup> Thus, there remains the question of what the most important recommendations relevant to physical therapy practice in the management of hip and/or knee OA may be.

This study used 2 high-quality international OA clinical guidelines<sup>16,39</sup> to identify and prioritize, by international consensus, the most important recommendations for physical therapists to implement when managing all patients with hip and/or knee OA.

## METHODS

THE PRESENT STUDY COMPRISED 3 sequential stages: (1) extraction of recommendations from 2 recent, high-quality clinical guidelines; (2) a 3-round Delphi survey to identify, by consensus, which of those recommendations would be relevant for physical therapists; and (3) a priority-ranking exercise

to rank the retained recommendations in order of perceived importance (FIGURE 1). Ethics approval was granted by The University of Melbourne Human Research Ethics Committee (Ethics ID 1750150). Participants gave implied consent by completion of the first survey.

### Stage 1: Extraction of Recommendations From Clinical Guidelines

All recommendations from the National Institute for Health and Care Excellence OA guidelines<sup>39</sup> and the European League

Against Rheumatism recommendations for the nonpharmacological core management of hip and knee OA<sup>16</sup> were extracted. Although several other OA clinical guidelines<sup>2,3,23,35</sup> also exist, these 2 were selected because they cover both assessment and treatment for hip and knee OA, and also score highly on methodological quality based on the Appraisal of Guidelines Research and Evaluation II tool.<sup>7,32,36</sup> For the purpose of this research, the investigators converted all original recommendations from both guidelines into instructional

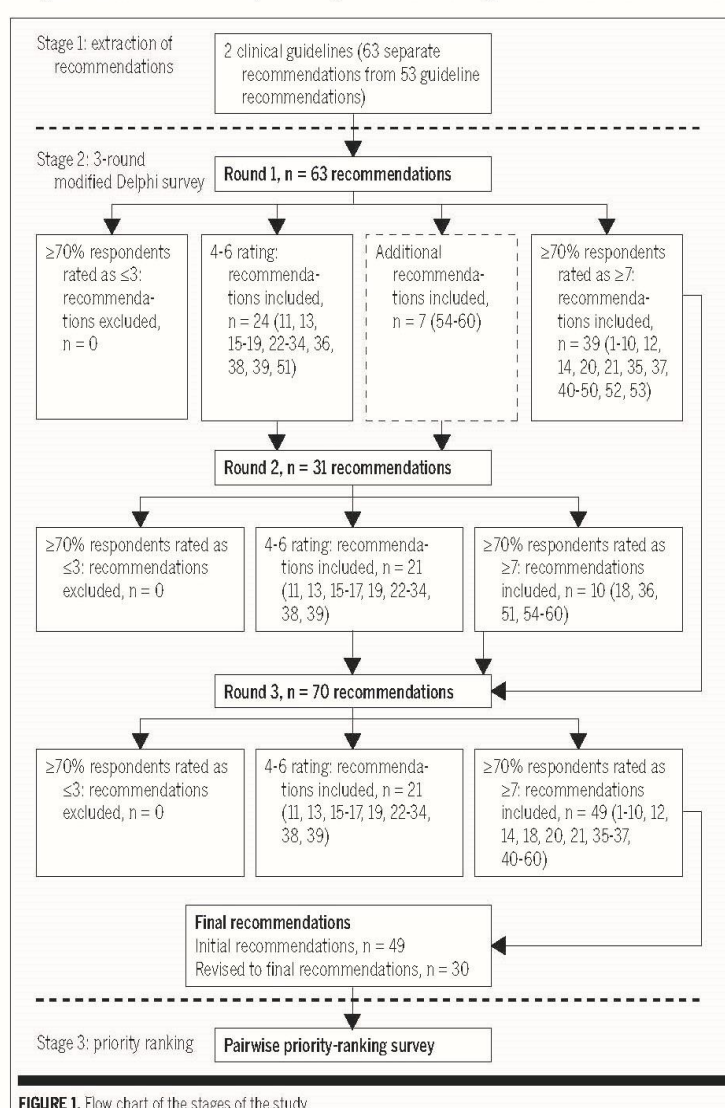


FIGURE 1. Flow chart of the stages of the study.

recommendations, ensuring that the meanings remained the same and were relevant to hip and/or knee OA only, with minimal alterations to wording. A final list was compiled for inclusion in the first round of the Delphi survey in stage 2 (**APPENDIX A**, available at [www.jospt.org](http://www.jospt.org)).

### Stage 2: Delphi Survey

A modified Delphi technique<sup>31</sup> was used to obtain consensus from a panel of experts on the most relevant recommendations for physical therapists. This method was chosen because it does not require face-to-face meetings,<sup>17,31</sup> thus allowing selection of expert participants from a geographically dispersed population.<sup>9</sup> In a modified Delphi study, the open-ended round in a classical Delphi panel discussion is replaced by providing the expert panel with relevant statements developed from the existing literature.<sup>22</sup> The experts on the panel could, however, provide any additional evidence-based recommendations they felt should be included in the list, given that we only included 2 clinical guidelines in this study.

**Sample Size** There is no set guidance available on determining sample size for Delphi studies.<sup>45,55</sup> A larger sample size increases the reliability of a consensus process such as a Delphi study, with a panel size of 12 or above deemed adequate to demonstrate improvement in reliability.<sup>38</sup> One study investigated the reliability of outcomes obtained from a Delphi panel of 23 participants and found that as long as the experts have similar training and knowledge, such a sample size is sufficient to ensure reliability and stability of results.<sup>1</sup> Based on previous studies,<sup>18,49</sup> we estimated a response rate for the first round of 45%, and 70% of the remaining participants for each of the subsequent 2 rounds.<sup>18,44</sup> We thus invited 132 participants, from whom we estimated that 60 would complete round 1 and at least 29 would be retained by round 3.

**Participants** An international panel of expert physical therapy clinicians and researchers was invited to participate via

e-mail. A list of potential participants was prepared by the investigators, drawing from their OA networks as well as within the field of published OA research. Contact e-mail addresses were obtained from publicly available sources, such as publications and university or clinical practice websites. The investigators also asked 10 national and international collaborators to provide names and contact details of clinicians from their countries who potentially met the eligibility criteria and might be interested in participating.

To be included as expert clinicians, respondents (1) had to be currently registered to practice as a physical therapist and (2) had to have seen at least 1 patient with hip and/or knee OA per week over the past 6 months. Expert researchers were required (1) to be a physical therapist and (2) to meet at least 1 of the following criteria: (a) first or last author on at least 2 papers per year on primary human research in hip and/or knee OA over the past 5 years; (b) invited to give a plenary or keynote presentation on hip and/or knee OA at an international conference in the last 5 years; or (c) obtained nationally competitive grant funding as the chief investigator for a clinical research project investigating hip and/or knee OA in the past 5 years.

**Procedure** Three sequential rounds of online surveys were conducted via Research Electronic Data Capture (REDCap) software (Vanderbilt University, Nashville, TN), hosted at The University of Melbourne. Potential participants were first sent an e-mail that contained a link to access further information about the study, confirm eligibility, and complete the questionnaire online. In the first round, participants were also asked to provide basic demographic information such as age, sex, location, education, number of years of clinical/research experience, average number of clinical practice hours per week, and the primary site of clinical practice. In all rounds, participants were required to rate each recommendation on an 11-point numeric rating scale (NRS) that ranged from 0 (not im-

portant) to 10 (extremely important) in response to the statement, "Please rate each of the following recommendations according to how important you believe they are for a physical therapist to implement in managing all people with hip and/or knee osteoarthritis." Participants were reminded in the survey to rate the importance of each recommendation for all patients with hip and/or knee OA rather than for a subset of patients. A final question in the first round asked participants for any additional evidence-based recommendations they felt should be included in the list.

Each Delphi round ran for 2 weeks, with approximately 6 weeks between rounds to allow for data collation and analysis. Each round took approximately 30 minutes to complete and could be done over multiple sessions. Two reminder e-mails were sent to nonresponders at 5-day intervals after the initial mailing in each round. Only participants who completed a survey round were included in the subsequent round.

**Defining Consensus** Although there is currently no standard threshold for consensus in the Delphi literature,<sup>31</sup> 70% consensus is a commonly used benchmark.<sup>14,49</sup> Thus, we defined consensus for the inclusion of a recommendation a priori as 70% or more of respondents rating a recommendation as 7 or above on the NRS. Recommendations were excluded if 70% or more of respondents rated a recommendation as 3 or below. The cutoffs of 7 and 3 on the NRS for the inclusion and exclusion of a recommendation, respectively, were adopted from a recent consensus study.<sup>49</sup> Recommendations that were rated between 4 and 6 on the NRS were required to be rerated in the subsequent round, regardless of the percentage of respondents rating them. These recommendations did not achieve consensus on inclusion or exclusion (ie, indicating panel uncertainty about an item) and were retained for a revote in the subsequent round, to allow the panel to "rescue" an item for inclusion. Recommendations from round 1 that were rated

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as 7 or above by 70% or more of respondents were added directly to round 3 for rerating. Additional recommendations generated from round 1 were included in round 2 for initial rating. Recommendations that were rated between 4 and 6 on the NRS in rounds 1 and 2 were rerated in rounds 2 and 3, respectively. Recommendations from round 2 that were rated as 7 or above by 70% or more of respondents were also added to round 3 for rerating.<sup>49</sup> Finally, only recommendations that were rated as 7 or above by 70% or more of respondents in round 3 were included in the final list of recommendations. The investigators reviewed duplicative content from the recommendations in the final list and merged it into a single recommendation, as appropriate, for the priority-ranking exercise in stage 3 (FIGURE 1).

**Data Analysis** For each recommendation, the percentage of respondents rating a recommendation 3 or less, between 4 and 6, or 7 or greater was calculated. The investigators discussed the additional recommendations nominated by the expert panel in round 1 and merged similar recommendations into a single recommendation as appropriate.<sup>31</sup> However, only recommendations that were deemed evidence based were accepted and included in round 2. A de-identified summary of the panel's responses for each recommendation from the previous round was e-mailed to participants prior to rounds 2 and 3. This process aimed to encourage the panel members to revise their earlier answers in light of the responses of other members.<sup>14</sup>

### Stage 3: Priority-Ranking Exercise

Participants were required to prioritize the final list of recommendations remaining after round 3 via an online decision survey created in the 1000minds program (1000minds Ltd, Dunedin, New Zealand). The 1000minds program is a multi-attribute decision analysis research tool that prioritizes and quantifies the relative importance of statements, reflecting expert consensus.<sup>21</sup> Participants

were presented with a series of paired recommendations (known as "pairwise rankings") and asked which of the 2 they believed was more important for physical therapists to implement in the management of all people with hip and/or knee OA. Based on participants' answers, 1000minds used background mathematics to arrive at individuals' rankings of the recommendations and the averaged rankings for the group.<sup>21</sup>

## RESULTS

### Participant Characteristics

SIXTY-TWO (47%) OF 132 INVITED experts completed round 1 of the Delphi survey. Of these, 20 were clinicians, 27 were researchers, and 15 identified themselves as both clinicians and researchers. Experts originated from 14 countries: Australia ( $n = 14$ ), Belgium ( $n = 2$ ), Brazil ( $n = 6$ ), Canada ( $n = 4$ ), Denmark ( $n = 5$ ), Ireland ( $n = 2$ ), Japan ( $n = 1$ ), the Netherlands ( $n = 5$ ), New Zealand ( $n = 6$ ), Norway ( $n = 3$ ), Saudi Arabia ( $n = 1$ ), Singapore ( $n = 2$ ), the United Kingdom ( $n = 7$ ), and the United States ( $n = 4$ ). Participants' characteristics are shown in TABLE 1. Of the 132 invited experts, 52 (39% of the original sample and 84% of round 1 respondents) completed round 2, 45 (34% of the original sample and 87% of round 2 respondents) completed round 3, and 35 (27% of the original sample and 78% of round 3 respondents) completed the priority-ranking exercise. Of the 35 participants who completed the whole study, 18 were researchers, 8 were clinicians, and 9 identified themselves as both clinicians and researchers.

### Delphi Survey

Fifty-three recommendations were extracted from the guidelines in stage 1. Two of these recommendations had 6 subcategories each. Thus, these 2 guideline recommendations became 12 separate recommendations, and the total number of recommendations presented to participants in round 1 of the Delphi survey

was 63. Rounds 1 and 2 were conducted from August to September and September to October 2017, respectively, with the final round undertaken from October to November 2017. FIGURE 1 represents the results of each Delphi round. In round 1, 70% or greater of the respondents rated 39 of the 63 recommendations as 7 or above on the NRS. These recommendations covered the diagnosis of OA, the individualized approach to OA management, education, exercise prescription, weight loss, use of aids or devices, vocational rehabilitation, goal setting, offering of core treatments prior to joint surgery, and avoidance of arthroscopic lavage and debridement (APPENDIX B, available at [www.jospt.org](http://www.jospt.org)). No recommendations were excluded in this round. An additional 9 recommendations were generated from the expert panel. After merging similar suggestions, 7 new recommendations (APPENDIX C, available at [www.jospt.org](http://www.jospt.org)) were included in round 2. These additional recommendations addressed depression screening, management of psychological distress, strategies to optimize adherence, personalized exercise and physical activity programs, information on exercising locally, and helping patients to understand the pain experience. The panel also suggested a "do not do" recommendation relating to herbal supplements.

Twenty-four (APPENDIX D, available at [www.jospt.org](http://www.jospt.org)) of the original 63 recommendations, plus 7 new recommendations from round 1, were included in round 2. Ten recommendations were rated as 7 or above on the NRS by 70% or greater of the respondents, and, again, no recommendations were excluded in this round. The 10 recommendations included 7 additional recommendations proposed by the expert panel and 3 relating to appropriate footwear and referral thresholds for joint surgery. Therefore, all original 63 recommendations as well as the 7 new recommendations were included in round 3 for rerating.

In round 3, 70% or greater of the respondents rated 49 of the 70 recommendations as 7 or above on the NRS for

importance (**APPENDIX E**, available at [www.jospt.org](http://www.jospt.org)), excluding 21 recommendations from stage 3 (**FIGURE 2**). Following revision by the investigators to remove duplicative content in the remaining 49 recommendations, a final list of 30 recommendations was generated for the priority-ranking exercise.

**TABLE 2** shows the final ranked list of priority recommendations, grouped by content area. There were 8 recommendations related to the principles of treatment planning and delivery, 4 to OA

diagnosis and assessment, 3 to physical therapy core treatments, 3 to adjunctive physical therapy treatments, 9 to review and referral, and 3 to communication.

## DISCUSSION

**T**HIS STUDY USED A CONSENSUS method and a priority-ranking exercise to produce and prioritize a list of the most important clinical guideline recommendations relevant to the scope of physical therapist practice when

managing hip and/or knee OA. Of the original 63 recommendations extracted from 2 high-quality OA clinical guidelines, as well as the 7 additional items nominated by the international expert panel, 49 achieved consensus as being important for physical therapists. Several were combined to produce a final list of 30 recommendations. Interestingly, none of the original recommendations reached consensus to be excluded. This implies that all recommendations from the 2 OA clinical guidelines are considered at least somewhat relevant to physical therapists when managing hip and/or knee OA, and highlights the important role physical therapists have in managing this condition. To facilitate communication of the findings, we have summarized the priority guideline recommendations for physical therapy management of hip and/or knee OA in **FIGURE 3**.

Several highly ranked recommendations (ranked 1-3, 8, 9, 11, and 17 in **TABLE 2**) were related to exercise and physical activity. This is not surprising, given that exercise is a core physical therapy intervention and surveys from different countries have found that exercise is commonly used by physical therapists to manage hip and knee OA.<sup>11,24,28,29,51</sup> These recommendations are supported by high-quality evidence showing that exercise decreases pain and improves function in this patient population.<sup>19,20</sup> Furthermore, engaging in a physically active lifestyle promotes many other health benefits for people with OA, including reducing risk of developing other major health conditions, such as heart disease and diabetes<sup>50</sup>; improving muscle strength, aerobic capacity, and mood<sup>46</sup>; as well as delaying progression of OA and functional limitations.<sup>52</sup> Despite the benefits of physical activity, research has shown that people with OA are not as physically active as people without OA.<sup>26</sup> People with OA often have comorbidities, such as obesity, heart disease, and diabetes, which increase their likelihood of poorer physical function.<sup>50,52</sup> Thus, improving exercise and physical activity levels in people with hip and/or knee OA, taking into account

**TABLE 1**

**CHARACTERISTICS OF THE EXPERT  
PANEL MEMBERS (N = 62)**

|                                                      | Value*  |
|------------------------------------------------------|---------|
| Age, y                                               |         |
| ≤30                                                  | 3 (5)   |
| 31-50                                                | 43 (69) |
| 51-70                                                | 16 (26) |
| Sex (female)                                         | 35 (57) |
| Highest educational qualification                    |         |
| PhD                                                  | 38 (61) |
| Master's degree (research)                           | 11 (18) |
| Postgraduate certificate/diploma                     | 7 (11)  |
| Bachelor's degree                                    | 4 (7)   |
| Other                                                | 2 (3)   |
| Time spent researching osteoarthritis, y (n = 42)    |         |
| ≤10                                                  | 19 (31) |
| 11-20                                                | 20 (32) |
| 21-30                                                | 3 (5)   |
| Time spent in clinical practice, y (n = 35)          |         |
| ≤10                                                  | 6 (10)  |
| 11-20                                                | 17 (27) |
| 21-30                                                | 7 (11)  |
| 31-40                                                | 5 (8)   |
| Average time in clinical practice weekly, h (n = 35) |         |
| 0-10                                                 | 10 (16) |
| 11-20                                                | 8 (13)  |
| 21-30                                                | 2 (3)   |
| 31+                                                  | 15 (24) |
| Primary site of clinical practice (n = 35)           |         |
| Private practice                                     | 13 (21) |
| Public community health center                       | 4 (7)   |
| Hospital                                             | 11 (18) |
| Other†                                               | 7 (11)  |

\*Values are n (percent).

†Rheumatology department (n = 1), university clinic (n = 2), home based (n = 2), primary care center (n = 1), and postsecondary institution (n = 1).

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TABLE 2

FINAL RANKED LIST OF RECOMMENDATIONS GROUPED BY CONTENT AREA

| Content Area/Rank*                        | Top 30 List of Recommendations†                                                                                                                                                                                                                                                                                                                | Panel Members<br>Rating ≥7 in<br>Round 3, % | Group Ranking    |      |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|------|
|                                           |                                                                                                                                                                                                                                                                                                                                                |                                             | Median (IQR)     | Mean |
| Principles of treatment planning/delivery |                                                                                                                                                                                                                                                                                                                                                |                                             |                  |      |
| 2                                         | Discuss and offer personalized exercise and a physical activity program according to needs, preferences, self-motivation, and ability to perform exercises. An appropriate program may include strengthening, aerobic exercise, land- or water-based exercise, and supervised or unsupervised exercise. The type and dosage should be tailored | 100                                         | 8.5 (4.8-12.8)   | 9.9  |
| 3                                         | Advise people with OA to exercise as a core treatment, irrespective of age, comorbidity, pain severity, or disability. Exercise should include local muscle strengthening and general aerobic fitness                                                                                                                                          | 98                                          | 9 (6.3-12.5)     | 10   |
| 8 <sup>‡</sup>                            | Agree on individualized self-management strategies with the person with OA. Ensure that positive behavioral changes such as exercise, weight loss, use of suitable footwear, and pacing are appropriately targeted (R9, R45)                                                                                                                   | 98                                          | 11 (6.3-17.0)    | 11.5 |
| 9                                         | Ensure that self-management programs for people with OA, either individually or in groups, emphasize the recommended core treatments, especially exercise                                                                                                                                                                                      | 98                                          | 11.5 (7.0-16.8)  | 11.8 |
| 10                                        | When lifestyle changes are recommended, offer people an individually tailored program, including long-term and short-term goals, intervention or an action plan, and regular evaluation and follow-up with possibilities for adjustment of the program                                                                                         | 100                                         | 11 (6.8-15.5)    | 11.8 |
| 12                                        | Incorporate strategies to optimize adherence to treatment recommendations (eg, offer booster sessions to increase adherence to exercise)                                                                                                                                                                                                       | 100                                         | 12 (7.8-20)      | 13.4 |
| 17 <sup>§</sup>                           | Select the mode of delivery of exercise education (eg, individual one-to-one session, group classes, etc) and use pools or other facilities according to the preference of the person and local availability and cost (R48, R59)                                                                                                               | 100                                         | 14 (11.3-19.3)   | 15.1 |
| 18                                        | Take into account comorbidities that compound the effect of OA when formulating the management plan                                                                                                                                                                                                                                            | 100                                         | 16.5 (11.3-21.8) | 15.7 |
| Diagnosis and assessment                  |                                                                                                                                                                                                                                                                                                                                                |                                             |                  |      |
| 7 <sup>§</sup>                            | Assess the effect of OA on the person's function, quality of life, occupation, mood, relationships, and leisure activities and assess health education needs, health beliefs, and motivation to self-manage (R3, R43)                                                                                                                          | 100                                         | 11.5 (6.8-15.8)  | 11.5 |
| 15                                        | Be aware that atypical features, such as a history of trauma, prolonged morning joint-related stiffness, rapid worsening of symptoms, or the presence of a hot, swollen joint, may indicate alternative or additional diagnoses                                                                                                                | 100                                         | 15.5 (8-21)      | 14.3 |
| 21                                        | Diagnose OA clinically without investigations when a person is 45 years of age or older, has activity-related joint pain, and has either no morning joint-related stiffness or morning stiffness that lasts no longer than 30 minutes                                                                                                          | 93                                          | 20 (8.5-25.5)    | 17.7 |
| 26                                        | Screen for depression using an accepted depression screening tool                                                                                                                                                                                                                                                                              | 87                                          | 24 (15-28)       | 20.8 |
| Physical therapy core treatments          |                                                                                                                                                                                                                                                                                                                                                |                                             |                  |      |
| 1                                         | Offer advice on the following core treatments to all people with clinical OA: access to appropriate information, activity and exercise, and interventions to achieve weight loss if the person is overweight or obese                                                                                                                          | 100                                         | 8.5 (5-12.8)     | 9.6  |
| 11                                        | Teach a regular individualized exercise regimen that includes strengthening (sustained isometric) exercise for both legs, including the quadriceps and proximal hip girdle muscles, aerobic activity and exercise, as well as adjunctive range-of-movement/stretching exercise                                                                 | 89                                          | 11 (6.3-20)      | 12.5 |
| 16 <sup>§</sup>                           | Offer interventions to achieve weight loss as a core treatment for people who are obese or overweight, incorporating individualized strategies that are recognized to effect successful weight loss and maintenance (R14, R50)                                                                                                                 | 84                                          | 12.5 (8.5-23.3)  | 14.7 |

Table continues on page 507

TABLE 2

FINAL RANKED LIST OF RECOMMENDATIONS GROUPED BY CONTENT AREA (CONTINUED)

|                                        |                                                                                                                                                                                                                                                                                                                          | Group Ranking           |                  |      |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------|------|
| Content Area/Rank <sup>a</sup>         | Top 30 List of Recommendations <sup>d</sup>                                                                                                                                                                                                                                                                              | Panel Members           |                  |      |
|                                        |                                                                                                                                                                                                                                                                                                                          | Rating ≥7 in Round 3, % | Median (IQR)     | Mean |
| Adjunctive physical therapy treatments |                                                                                                                                                                                                                                                                                                                          |                         |                  |      |
| 23 <sup>†</sup>                        | Consider the use of walking aids, assistive technology, and adaptations at home and/or at work to reduce pain and increase participation (R20, R52)                                                                                                                                                                      | 98                      | 20.5 (11.8-25.5) | 18.6 |
| 29 <sup>†</sup>                        | Offer the person advice on appropriate and comfortable shoes (R18, R51)                                                                                                                                                                                                                                                  | 84                      | 27 (19.8-28)     | 23.4 |
| 30                                     | Do not offer herbal supplements to people with hip and/or knee OA                                                                                                                                                                                                                                                        | 80                      | 29.5 (28.5-30)   | 27.8 |
| Review and referral                    |                                                                                                                                                                                                                                                                                                                          |                         |                  |      |
| 6                                      | Ensure that the person with OA has been offered at least the core (nonsurgical) treatment options before referring the person for consideration of joint surgery                                                                                                                                                         | 100                     | 11 (6.5-14.3)    | 11.2 |
| 14                                     | When discussing joint surgery, check that the person has been offered at least the core treatments for OA, and give information about the benefits and risks of surgery and the potential consequences of not having surgery, recovery, and rehabilitation                                                               | 98                      | 12.5 (6.3-21.8)  | 14.1 |
| 19                                     | Consider referral for joint surgery for people with OA who experience joint symptoms (pain, stiffness, and reduced function) that have a substantial impact on their quality of life and are refractory to nonsurgical treatment                                                                                         | 96                      | 17 (10.3-24.3)   | 17.2 |
| 20                                     | Manage any psychological distress of the person (eg, referral to another health professional if required)                                                                                                                                                                                                                | 96                      | 20 (11.8-25)     | 17.4 |
| 22                                     | Do not refer for arthroscopic lavage and debridement as part of treatment for OA, unless the person has knee OA with a clear history of mechanical locking (as opposed to morning joint stiffness, "giving way," or X-ray evidence of loose bodies)                                                                      | 100                     | 20.5 (11.5-26)   | 18.5 |
| 24                                     | For people who are at risk of work disability or who want to start/return to work, provide them with rapid access to vocational rehabilitation, including counseling about modifiable work-related factors                                                                                                               | 89                      | 20 (13.5-25)     | 18.8 |
| 25                                     | Offer regular reviews to all people with symptomatic OA. Agree on the timing of the reviews with the person                                                                                                                                                                                                              | 91                      | 21 (16.8-26.3)   | 20.1 |
| 27                                     | Consider an annual review for any person with 1 or more of the following: troublesome joint pain, more than 1 joint with symptoms, more than 1 comorbidity, and/or taking regular medication for OA                                                                                                                      | 84                      | 23 (18.5-25.8)   | 20.8 |
| 28                                     | Base decisions on referral thresholds for joint replacement surgery on discussions between patient representatives, referring clinicians, and surgeons, rather than using scoring tools for prioritization                                                                                                               | 80                      | 24 (19.3-27)     | 22.2 |
| Communication essentials               |                                                                                                                                                                                                                                                                                                                          |                         |                  |      |
| 4 <sup>†</sup>                         | Agree on a plan with the person (and family members/carers) for managing OA, individualized according to the wishes and expectations of the individual, localization of OA, risk factors, presence of inflammation, structural change, pain, activity restriction, societal participation, and quality of life (R4, R44) | 100                     | 8.5 (4.5-13.5)   | 10.3 |
| 5 <sup>†</sup>                         | Offer accurate verbal and written information to enhance understanding of OA and its management, understanding of pain experience, and to counter misconceptions. Ensure that information sharing is an ongoing, integral part of the management plan rather than a single event at time of presentation (R8, R46, R60)  | 100                     | 12 (4.8-15.3)    | 10.5 |
| 13                                     | Discuss the risks and benefits of treatment options with the person, taking into account comorbidities. Ensure that the information provided can be understood                                                                                                                                                           | 100                     | 15 (7.5-19.3)    | 13.8 |

Abbreviations: IQR, interquartile range; OA, osteoarthritis; R, recommendation.

<sup>a</sup>The numbers represent the ordinal ranking of the priority values. For example, 1 is first; that is, this is the top ranking for the group.

<sup>b</sup>The final list of 30 recommendations was generated following revision of the remaining 49 recommendations from round 3. The complete original recommendations can be found in APPENDICES A and C.

<sup>c</sup>When there were recommendations with duplicative content, the recommendation with the highest agreement was accepted.

<sup>d</sup>Recommendations with similar key characteristics were combined to create this unique recommendation.

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comorbidities, is an important management goal.

The recommendation ranked 12 in **TABLE 2** was related to strategies to enhance exercise adherence. This is important, given that clinical benefits of exercise tend to decline over time due to poor adherence.<sup>34,42</sup> Adherence is a predictor of the long-term effectiveness of exercises, both within and after a treatment period.<sup>42,43</sup> Additional booster sessions following supervised treatment have been found to positively influence the outcomes of exercise in the long term.<sup>40,48</sup>

Patient education is another key component in the management of hip and/or knee OA and was highly ranked (1, 5, 8, 10, and 13 in **TABLE 2**) by the expert panel. Patients should receive information about OA diagnosis, prognosis, and the risks and benefits of treatment options<sup>46</sup> in order to promote active participation and allow informed choices to be made. Increased knowledge also gives patients greater control over their own health care

decisions.<sup>6,27</sup>

Advice about weight loss was included in the recommendation ranked highest by the physical therapists. In addition, a recommendation relating to provision of strategies to support weight loss was ranked 16th. The latter is perhaps surprising, as many physical therapists do not consider tackling weight loss as within their scope of practice.<sup>46,47</sup> Furthermore, not all physical therapists feel competent to initiate a conversation about weight with patients, or to effectively provide weight-loss interventions to patients who are overweight or obese.<sup>47,50,57</sup> In light of the importance of weight loss for this patient population and the high ranking of recommendations relating to weight loss by the expert panel, educating physical therapists to provide weight-management advice and interventions, as well as to support behavior change, may be a priority for the profession.

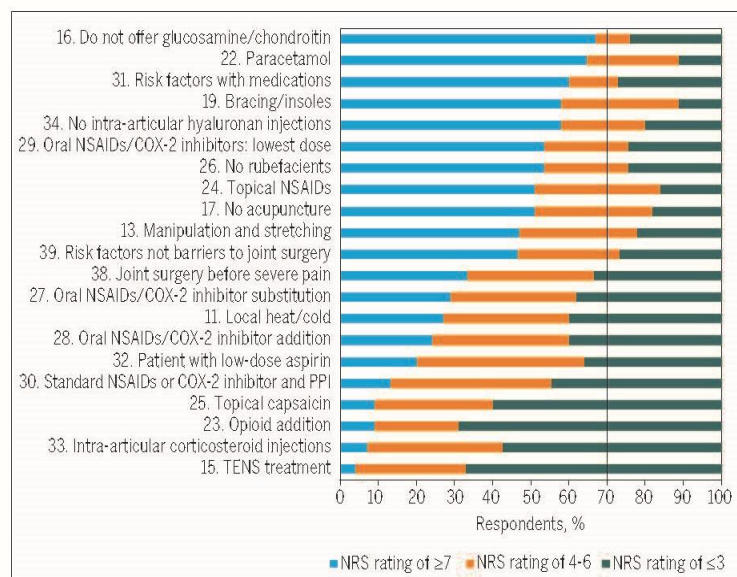
Thirty-three percent (n = 21) of the extracted recommendations did not

reach consensus among the expert panel to be included following round 3. Of note, recommendations regarding pharmacological management of OA were excluded. In contrast and as expected, implementation of recommendations about pharmacological management was identified as the top-priority task for general practitioners when consulting people with OA in a previous consensus study.<sup>44</sup> These recommendations were not rated highly by the majority of the physical therapists, possibly because not all physical therapists worldwide are able to prescribe medications within their scope of practice.<sup>37</sup>

Recommendations that proposed thermotherapy, electrotherapy, and manual therapy as adjunct treatments for people with OA were also not ranked highly by physical therapists, even though these treatment modalities are within the scope of physical therapy practice globally and are often used by physical therapists.<sup>11,25,51,53</sup> A possible reason may be that these treatment modalities have somewhat conflicting evidence of their effectiveness, as reflected by varying recommendations across other clinical guidelines.<sup>8,28,38</sup> Another reason for the exclusion of these recommendations may be the wording of the question in the consensus exercise, which directs physical therapists to nominate recommendations that would be applicable to all patients with hip and/or knee OA rather than to subsets of patients.

### Future Implementation Strategies

There are numerous clinical practice guidelines for OA, but they are not specifically for physical therapists. This study identified and prioritized assessment and treatment recommendations that apply to all patients with hip and knee OA and that were the most relevant for physical therapist practice. Establishing the most relevant physical therapist-specific recommendations can inform the content of educational programs, self-assessment of quality of care, and benchmarking and practice audit tools,<sup>8,28,38</sup> and may thus



**FIGURE 2.** The percentage of participants rating the 21 recommendations that were excluded in round 3 (priority-ranking exercise) because they did not reach consensus for inclusion. Recommendations were rated on an NRS as 3 or less, between 4 and 6, or 7 or greater out of 10, where 0 is not important and 10 is extremely important. Inclusion was defined as at least 70% of respondents rating the item as at least 7 on the NRS. Abbreviations: COX, cyclo-oxygenase; NRS, numeric rating scale; NSAID, nonsteroidal anti-inflammatory drug; PPI, proton-pump inhibitor; TENS, transcutaneous electrical nerve stimulation.

help improve practice and reduce the use of ineffective treatments/advice. In addition, the list of ranked recommendations provides a foundation to develop quality indicators for physical therapy care of people with hip and/or knee OA.

In general, the results of this study can inform physical therapists of the recom-

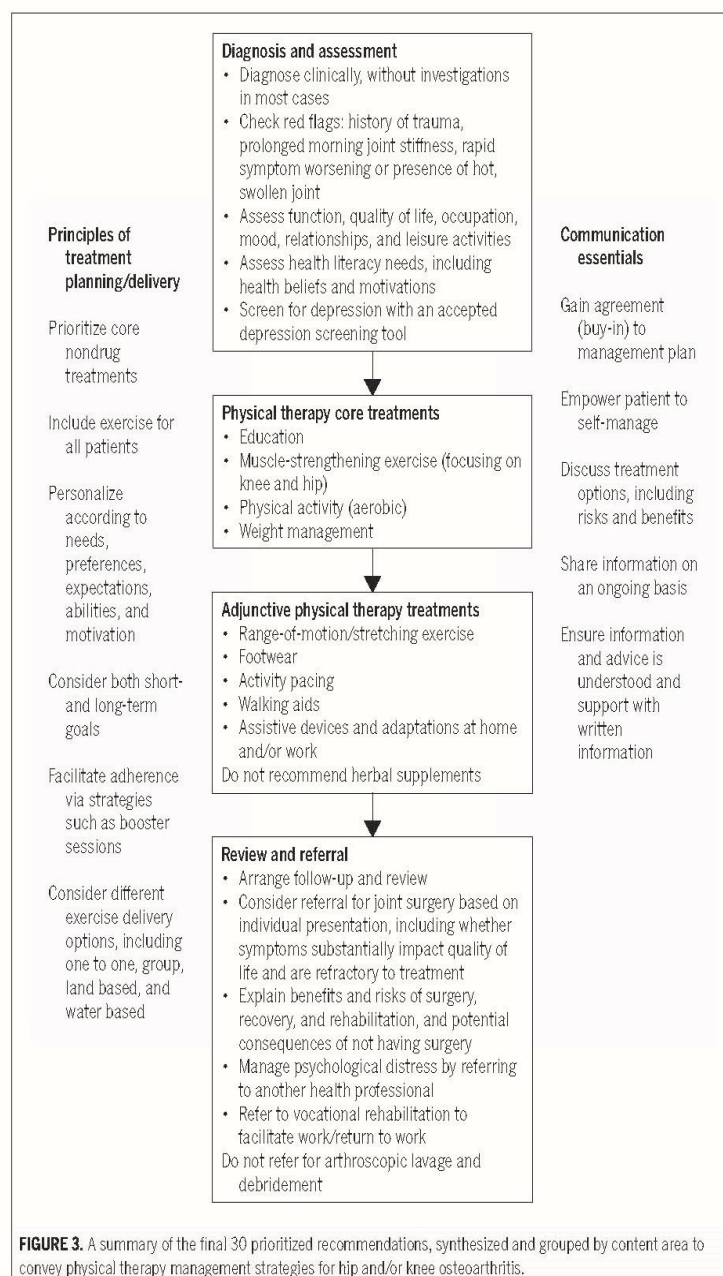
mendations that are important in order to provide optimal care in their physical therapy clinical practice. All 30 recommendations should be considered if comprehensive evidence-based management is to be provided. The results can be useful as a checklist for physical therapists when self-auditing their own practice. They can

also be used when designing new or reviewing existing OA programs/services.

### Strengths and Limitations

A strength of this study was the inclusion of physical therapists from diverse geographical locations and with different scopes of practice, cultures, training, and health care contexts to ensure that the findings reflected the potential diversity of opinion. The Delphi expert panel was recruited from 14 countries across several continents to gain an international perspective. There was a mix of researchers and clinicians from various clinical settings. Other strengths include robust methodology that fulfilled proposed quality indicators for a Delphi study (eg, reproducible participant criteria; pre-specification of the number of Delphi rounds, with clear criteria set a priori for dropping or excluding items<sup>46</sup>), a large sample size, and good response rates to the Delphi rounds<sup>41</sup> and priority-ranking exercise.

This study has several limitations. First, the results may not represent best practice for physical therapists working in all contexts and geographical locations. More than 56% of the expert panel identified themselves as clinicians (20 clinicians and 15 clinicians/researchers out of 62 respondents). Thus, over half the panel identified themselves as having a clinical role. Nonetheless, future work would benefit from greater representation of clinicians who manage hip and knee OA. Second, the response rate to the first Delphi round was low (47%), although this was slightly higher than the a priori estimated rate (45%). In addition, the views of the participating physical therapists may differ from those who declined participation and from other physical therapists not contacted. Third, the study was confined to the opinions of physical therapists. The perspectives of patients would have been valuable, as patients differ from physical therapists in their expectations and preferences. Fourth, we extracted recommendations from 2 clinical guidelines and might have



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missed important recommendations included in others. Furthermore, we used generic OA clinical guidelines because, at the time of study planning, there were no current physical therapist-specific hip and knee OA guidelines. Since then, the 2009 clinical guideline for hip OA developed by the Orthopaedic Section of the American Physical Therapy Association<sup>10</sup> has been updated. The recommendations relating to weight loss, patient education, individualized exercise and physical activity, as well as use of assistive devices are consistent with the findings of our study. The main differences are that the updated guideline<sup>10</sup> by the Orthopaedic Section of the American Physical Therapy Association provides more recommendations around hip assessment and additionally recommends manual therapy, bracing, and ultrasound. Finally, some of the final recommendations were similar, which created overlap and redundancy. Thus, a useful next step could be to reword the recommendations in order to create a new list without duplication across items. This could be achieved by using focus groups of physical therapists or by using a conceptualization method such as concept mapping.<sup>46</sup>

## CONCLUSION

A LARGE PANEL OF RESEARCH AND clinical physical therapists has identified relevant recommendations from clinical guidelines and prioritized those most important for physical therapists to implement when managing all patients with hip and/or knee OA. The findings can help direct evidence-based management to ultimately improve outcome for patients with the condition. The results can also be used to guide training of physical therapy students and graduates in OA management, as well as to contribute to the formulation of quality care indicators and subsequent evaluation of evidence-practice gaps. Future research is required to determine how to best utilize and implement the recommendations in physical therapy clinical practice. ●

## KEY POINTS

**FINDINGS:** Thirty recommendations were identified and prioritized by international physical therapists as those most important for physical therapists when managing all patients with hip and/or knee osteoarthritis (OA). The top recommendations were related to the provision of education, prescription of exercise and weight loss, individualized OA assessment, and treatment and communication strategies.

**IMPLICATIONS:** Findings can assist physical therapists to implement evidence-based care for patients with hip and/or knee OA in daily practice, facilitate self-evaluation of care provided, and be used to assess care gaps in the future.

**CAUTION:** As recruitment did not cover all geographical regions and the initial response rate was less than 50%, the views of participants may not fully represent the wider physical therapy population.

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## **Chapter Four Patient-reported quality indicators to evaluate physiotherapy care for hip and/or knee osteoarthritis- development and evaluation of the QUIPA tool**

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Author contributions for this chapter are the following: PLT, RSH, TE, KSD and KLB contributed to the study conception and design. PLT completed data collection. PLT, RSH, TE, KSD, JK and KLB contributed to the data analysis and interpretation of data. PLT wrote the first draft of the manuscript. All authors revised the paper and provided scientific input. All authors approved the final version of the manuscript.

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The aim of this Chapter is to develop a patient-reported QI tool to evaluate physiotherapy care for people with hip and/or knee OA and to evaluate its clinimetric properties. This Chapter utilises findings from Chapter Three to develop the QI tool.

## RESEARCH ARTICLE

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# Patient-reported quality indicators to evaluate physiotherapy care for hip and/or knee osteoarthritis- development and evaluation of the QUIPA tool

Pek Ling Teo<sup>1\*</sup>, Rana S. Hinman<sup>1</sup>, Thorlene Egerton<sup>1</sup>, Krysia S. Dziedzic<sup>2</sup>, Jessica Kasza<sup>3</sup> and Kim L. Bennell<sup>1</sup>

## Abstract

**Background:** There is no physiotherapy-specific quality indicator tool available to evaluate physiotherapy care for people with hip and/or knee osteoarthritis (OA). This study aimed to develop a patient-reported quality indicator tool (QUIPA) for physiotherapy management of hip and knee OA and to assess its reliability and validity.

**Methods:** To develop the QUIPA tool, quality indicators were initially developed based on clinical guideline recommendations most relevant to physiotherapy practice and those of an existing generic OA quality indicator tool. Draft items were then further refined using patient focus groups. Test-retest reliability, construct validity (hypothesis testing) and criterion validity were then evaluated. Sixty-five people with hip and/or knee OA attended a single physiotherapy consultation and completed the QUIPA tool one, twelve- and thirteen-weeks after. Physiotherapists ( $n = 9$ ) completed the tool post-consultation. Patient test-retest reliability was assessed between weeks twelve and thirteen. Construct validity was assessed with three predefined hypotheses and criterion validity was based on agreement between physiotherapists and participants at week one.

**Results:** A draft list of 23 clinical guideline recommendations most relevant to physiotherapy was developed. Following feedback from three patient focus groups, the final QUIPA tool contained 18 items (three subscales) expressed in lay language. The test-retest reliability estimates (Cohen's Kappa) for single items ranged from 0.30–0.83 with observed agreement of 64–94%. The intraclass correlation coefficient (ICC) and 95% confidence interval (CI) for the Assessment and Management Planning subscale was 0.70 (0.54, 0.81), Core Recommended Treatments subscale was 0.84 (0.75, 0.90), Adjunctive Treatments subscale was 0.70 (0.39, 0.87) and for the total QUIPA score was 0.80 (0.69, 0.88). All predefined hypotheses regarding construct validity were confirmed. However, agreement between physiotherapists and participants for single items showed large measurement error (Cohen's Kappa estimates ranged from – 0.04–0.59) with the ICC (95% CI) for the total score being 0.11 (– 0.14, 0.34).

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\* Correspondence: [plteo@student.unimelb.edu.au](mailto:plteo@student.unimelb.edu.au)

<sup>1</sup>Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, Melbourne, Victoria 3010, Australia

Full list of author information is available at the end of the article



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**Conclusions:** The QUIPA tool showed acceptable test-retest reliability for subscales and total score but inadequate reliability for individual items. Construct validity was confirmed but criterion validity for individual items, subscales and the total score was inadequate. Further research is needed to refine the QUIPA tool to improve its clinimetric properties before implementation.

**Keywords:** Quality indicators, Physiotherapy, Hip, Knee, Osteoarthritis, Patient-reported, Reliability, Validity, Quality of care

## Background

Osteoarthritis (OA) is a leading cause of joint pain and disability worldwide [1] with the overall prevalence of hip and knee OA in the adult population approximately 11 and 24% respectively [2]. Osteoarthritis costs Australia's economy \$22 billion annually, and the burden of OA is expected to rise due to the ageing population and obesity [3, 4]. Physiotherapists play an integral role in providing non-pharmacological management for OA. A systematic review of patients' perceived health service needs for OA showed that patients generally perceive physiotherapists to be important to assist them in managing their condition and prescribing exercises [5].

Despite international OA guidelines recommending exercise and weight loss [1, 6, 7] as first line treatments for OA, their uptake is suboptimal in physiotherapy practice [8–11]. Quality indicators (QIs) can be used to assess physiotherapists' adherence to clinical guidelines recommendations and are accepted tools for assessing OA care [12–14]. They represent minimal acceptable standards of practice [15, 16] and are typically developed via consensus techniques [17, 18]. Quality indicators can be assessed by auditing medical records [18] however, these do not always include information pertaining to quality of care. Self-reporting by health professionals is another method but may introduce bias. To overcome limitations of these methods, patient-reported QIs are an alternative option to assess quality of OA care. Patient involvement in quality assessment is also valuable to enhance quality and relevance of research [19] as well as to promote patient-centred care, one of the six pillars of high quality care [20].

A systematic review conducted in 2013 identified QIs from 32 papers pertaining to non-pharmacological, pharmacological and surgical management for OA [13] but found only one study [21] (from Norway) that developed QIs in a patient-reported format. Blackburn and colleagues [22] later developed a similar QI questionnaire in the United Kingdom (UK) by including items from the Norwegian questionnaire. The UK-QI questionnaire was subsequently used by patients across several European countries to assess the care they received

from a range of health professionals for their OA management [23, 24]. However, the UK questionnaire was not tailored to specifically evaluate physiotherapy care. In the Netherlands in 2016, a set of QIs for physiotherapy management in hip and knee OA was established using a Delphi technique [25] but was not developed into a patient-reported tool. Furthermore, the QIs were based on older clinical guidelines from 2011 [26] and were not developed with an international perspective given they only recruited a national group of experts for their Delphi panel.

Given the lack of specific patient-reported QIs to assess physiotherapy care for hip and/or knee OA, this study aimed to develop a patient-reported QI tool and to evaluate its clinimetric properties. It is vital to establish the validity and reliability of QI tools if the results are to accurately reflect physiotherapy practice and/or be used to guide decision-making to improve clinical services [27]. These measurement criteria are prerequisite for any quality measure and should be established prior to implementation of the QIs [16, 18].

## Methods

### Phase 1: tool development

We used two sequential stages to develop the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool: 1) drafting of patient-reported QIs based on clinical guideline recommendations most relevant to physiotherapy practice identified from a recent consensus study [28] and the UK-QI questionnaire [22] and 2) refinement of the language and format of the QUIPA tool to ensure it was consumer friendly.

The research members involved in this study included physiotherapists who are also experts in OA research (KB, RH, TE, KD) and QI development and implementation (KD). KD has extensive experience in QI development and use for implementation of National Institute for Health and Care Excellence Quality Standards through clinical tools and patient questionnaires. KD was involved in the UK-QI study [13] which included patient and public involvement and engagement, as experts by experience.

### Stage 1 – drafting of patient-reported quality indicators for physiotherapy care

Draft QIs were derived from a final list of clinical guideline recommendations for hip and/or knee OA proposed by a recent consensus study as being most relevant to physiotherapy care [28]. The study first extracted recommendations from two high-quality clinical guidelines [1, 29] and then included a panel of 62 international physiotherapists to complete an online modified-Delphi survey, followed by a priority-ranking exercise in order to identify and rank recommendations most relevant for physiotherapy practice. The final 30 recommendations were then synthesized and grouped by content area to convey a physiotherapy management for hip and/or knee OA. A conceptual model based on the results of the study [28] was used when developing the QUIPA tool. The four main content areas of the final recommendations were condensed to form the three subscales of the QUIPA tool. We aimed to develop a QI relevant to each of the 30 recommendations on the final list, whilst minimising redundancy across items. Thus, where recommendations were similar, we only developed a QI based on the highest ranked recommendation [28]. We did not develop a QI for recommendations if it was deemed by the research experts as difficult to assess in a physiotherapy consultation; captured in another individual QI; related to a health service program instead of an individual treatment or unable to be executed by a physiotherapist (e.g. referring patients for joint surgery). Where the recommendations overlapped with those in the UK-QI questionnaire [22], we utilised similar phrasing as the UK-QI questionnaire because it had been through a rigorous development process, involved patient participation and was based on the most recent QIs, both from the Norwegian patient-reported QI questionnaire [21] and the systematic review in 2013 [13]. Although the Norwegian team has since revised and validated their QI questionnaire [30], it contains similar QIs to that of the previous version. The first draft of the QUIPA tool is attached in Additional file 1.

### Stage 2 – refinement of the language and format of the QUIPA tool

#### *Patient and public involvement*

A convenience sample of 15 people with hip and/or knee OA living in Melbourne, Australia were recruited from our research database and via Facebook to participate in one of three face-to-face focus groups to further refine the QUIPA tool. Inclusion criteria were: i) aged 45 years or above, ii) being told they had OA in their hip and/or knee by a health professional, iii) saw a physiotherapist for their hip and/or knee OA over the last 3 months, and iv) able to attend the University for allocated session date/time. Ethical approval was granted by the School of

Health Sciences Human Ethics Advisory Group, University of Melbourne (Ethics Application 1,750,532).

Each focus group session ran for 90 min and was moderated by a research team member and an assistant. Sessions were audio-recorded. Participants firstly completed a questionnaire about demographics as well as hip/knee pain and function. They were then presented with the draft QUIPA tool and asked to explain what they understood each QI item meant to ensure consistency with its original intent, a technique known as cognitive debriefing [31]. They were also asked to comment on wording clarity. The QUIPA tool was projected onto a presentation screen to allow the research assistant to alter the wording of the QIs in real time during the group session. Participants were also asked to comment on the appropriateness of the tool response scale and its overall format and layout [22, 32]. The research team revised and reworded the QUIPA tool following each focus group session before presenting the revised version to the subsequent group. Additional file 10 represents the final version of the QUIPA tool.

### Phase 2: Clinimetric evaluation of the QUIPA tool

The evaluation study was performed between August and December 2018. Participants with hip and/or knee OA were recruited to attend a single one-on-one consultation with a designated study physiotherapist for assessment and treatment of their affected joint(s). They were then required to complete the QUIPA tool online at three time points: one week (W1), twelve weeks (W12) and thirteen weeks (W13) after their consultation. A three-month recall period was selected for the QUIPA tool to capture either single or multi-session episodes of physiotherapy care and has been utilised in other comparable tools [22, 23]. For the purpose of this study, participants were asked not to have any further physiotherapy consultations for their affected hip and/or knee joint(s) during the thirteen weeks to avoid treatment confusion. For the purpose of this clinimetric evaluation, we also established a physiotherapist version of the QUIPA tool, which contained the same items but worded from the physiotherapists' perspective. Physiotherapists completed the tool immediately post-consultation (W0). Ethical approval was granted by the School of Health Sciences Human Ethics Advisory Group, University of Melbourne (Ethics Application 1,750,925).

To evaluate patient test-retest reliability, we examined the participant responses between W12 and W13. We used three a priori hypotheses to assess construct validity. The hypotheses reflected anticipated response patterns among contrasting subgroups in relation to body mass index (BMI), pain level with walking and daily functional ability [21]. Criterion validity was determined

by assessing agreement between physiotherapists and participants at W1. We defined responses from the physiotherapists as 'gold standard' as we expected their responses to be the most accurate compared to the participants since they completed the tool immediately after the consultation session and knew what treatment they had administered.

#### **Study participants**

A convenience sample of adults aged 45 years or over with self-reported hip and/or knee OA were recruited from the CHESM research database and by advertisements on Facebook. We aimed for a minimum of 50 people to participate in the clinimetric study because this sample size is the minimum recommended for any health questionnaire validity and/or reliability study [33]. The proposed minimum sample size allowed for a broad cross-sectional representation of people with hip and/or knee OA, including ages, genders and OA severity.

Participants were required to meet the National Institute for Health and Care Excellence OA clinical criteria: i) aged 45 years or above ii) have activity-related hip and/or knee pain and 3) have no more than 30 min of morning stiffness in their hip and/or knee. Participants were excluded if they had inflammatory arthritis, had undergone hip/knee replacement surgery for the affected hip/knee(s), planned to see another physiotherapist within thirteen weeks and/or were unable to give consent, attend an appointment with one of the study physiotherapists or to complete the questionnaires online at the specified time points.

We recruited nine physiotherapists currently registered to practise in Australia and working in private practice settings within Melbourne to ensure geographical spread around Melbourne for participants' convenience.

#### **Procedure**

Participants received one consultation from their designated study physiotherapist at no cost to themselves. In order to increase variability in the care provided within a standard 30-min consultation, physiotherapists were provided with different cue cards that contained specific tasks/treatments they were requested to do, or not do, with the participants. Participants were informed that the physiotherapists were going to provide a range of different treatments to different participants, and thus individual participants did not have any pre-conceived ideas about what they would or would not receive. Participants were emailed a link to the online QUIPA tool at one, twelve and thirteen weeks following their physiotherapy session and were asked to complete the tool as soon as they could. With the W1 QUIPA tool, participants were also asked to provide information about demographic, other medical conditions, height and

weight as well as to complete the pain and function subscales of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Participants were asked whether they had seen another physiotherapist each time they completed the QUIPA tool. Reminder emails and text messages were sent to non-responders daily (up to three times) after responses were due. To maximise completion of surveys [34], those who completed all three were entered into a draw to win a \$100 gift card.

Physiotherapists were asked to complete the QUIPA tool online immediately following each consultation. Physiotherapists were reimbursed \$60 for each participant they saw.

#### **Statistical analysis**

##### **Reliability**

Test-retest reliability of the QUIPA tool for participants was determined by comparing their responses between W12 (+/- 7 days) and W13 (-2 /+ 7 days). Test-retest reliability for individual QI items was assessed by calculating Cohen's Kappa (95% confidence intervals CI), percentage of observed agreement (i.e. the percentage of occasions when the answer was identical between W12 and W13), and percentage of expected agreement (i.e. the percentage of occasions when the answer was expected by chance to be identical between W12 and W13). Cohen's Kappa compares the expected agreement to that observed. Kappa values were interpreted according to Landis and Koch [35]: 0–0.20 slight; 0.21–0.40 fair; 0.41–0.60 moderate; 0.61–0.80 substantial and 0.81–1.00 almost perfect reliability.

Test-retest for each QUIPA subscale and the total score was assessed with intraclass correlation coefficients (ICC) (95% CI) estimated using a two-way mixed effect model. An ICC of  $\geq 0.70$  was considered acceptable [33].

##### **Validity**

Construct validity was assessed with three predefined hypotheses. We first hypothesized that people responding 'not overweight' for the QI on benefits of losing weight (item #13a) would self-report lower BMI compared to those responding 'yes', 'no' or 'don't remember'. We also hypothesized that people responding 'no such problems' for the QIs on the walking aid item (#14) and the appliances and aids item (#15) would report no difficulty with walking and score lower for total physical function score on the WOMAC respectively compared to those responding 'yes', 'no' or 'don't remember'. Chi-square tests were used to test the first and second hypotheses and a t-test was used for the third hypothesis. The *p*-value cut off for statistical significance was  $\leq 0.05$  for both statistical tests. Validity was considered

acceptable if  $\geq 75\%$  of the predefined hypotheses were confirmed [33].

Criterion validity of the QUIPA tool was determined by assessing agreement between physiotherapists and participants at W1 on individual items, each subscale and the total score of the QUIPA tool. To assess agreement for individual QI items, Cohen's Kappa (95% CI), the percentage of observed agreement and percentage of expected agreement between physiotherapists and patients were calculated. Agreement for each subscale and the total score was assessed with an ICC (95% CI) estimated using a two-way mixed effect model.

#### *Pass rates for individual QIs*

The pass rate (%) for each QI was calculated based on responses from physiotherapists and patients at Week 1, where the numerator represented the total of 'yes' answers for the QI and the denominator was the total of 'yes' and 'no' answers for the QI. The denominator did not include other response options as they were deemed not relevant to a calculation of pass rate.

## **Results**

### **Phase 1: tool development**

#### *Stage 1 – drafting of patient-reported quality indicators for physiotherapy care*

Thirty recommendations were extracted from the consensus study that identified the clinical guideline recommendations most relevant to physiotherapy practice [28]. Of these, QIs were not developed for 11 recommendations and six recommendations were partly excluded (Additional file 2). The remaining 19 recommendations (Additional file 1) were converted into QIs, utilizing the phrasings from the UK-QI questionnaire [22] where possible. Of these 19, four recommendations were converted into two QIs each whilst only one QI was generated from each of the remaining 15 recommendations. Thus in total, 23 QIs formed the first draft of the QUIPA tool. Each QI was assigned with either a three or four-level response scale (i.e. 'yes'/'no'/'don't remember' or 'yes'/'no'/'don't remember'/'no such problems' or 'not overweight' or 'already doing own exercise program') (Additional file 1).

#### **Stage 2 – refinement of the language and format of the QUIPA tool**

##### *Patient and public involvement*

The first focus group was conducted with seven participants and the other two groups with four each. The mean (standard deviation) age of the participants was 63.9 (9.1) years and all had either knee OA or hip and knee OA. Participants' characteristics are provided in Additional file 3.

#### *Focus group feedback*

Following feedback from the focus groups, several changes were made to the draft QUIPA tool (Additional file 1). This included reducing the number of items on the tool to ease participant burden (Q6-8a, Q17), removing items that were perceived to be too vague to participants (Q5 & 19), reducing words to improve clarity (Q1, 4, 8a, 8b, 8c, 9a, 9b, 16 and 18), avoiding multiple dimensions of care within a single item by splitting the QI into two questions (Q3) and expanding some QIs to improve specificity (Q2, 14). One item (Q20) was removed due to conflicting evidence supporting its effectiveness that emerged during the course of the study. Participants felt that the three-month recall period was appropriate and were satisfied with the response options and format of the tool.

#### *Final QUIPA tool*

The final version of the QUIPA tool comprised 18 items (Additional file 10: Table S1 and Additional file 1), organised into three subscales (Additional file 10: Table S1). The first subscale was Assessment and Management Planning and comprised the six items concerning OA assessment, comorbidities, screening for depression, depression referral, management planning and review. The second subscale was Core Recommended Treatments and contained the eight items concerning OA and related pain, education about different treatment options for OA, specific exercise program prescription, exercise preferences, exercise adherence, education about benefits of weight loss and strategies for losing weight. In this subscale, if 'no' was ticked for the item relating to specific exercise program prescription (item #10), then the item concerning exercise adherence (item #12) was automatically omitted by the scorer as not applicable. In addition, if an answer other than 'yes' was ticked for the item relating to benefits of weight loss (item #13a), the item addressing strategies for losing weight (item #13b) was also omitted as not applicable. The final subscale was Adjunctive Treatments and consisted of the four items relating to walking aids, appliances and aids, work-related advice and footwear.

#### *Scoring instructions for the QUIPA tool*

Table 1 represents the scoring instructions for the QUIPA tool. The pass rate (%) for each subscale was calculated independently, where the numerator represented the total of 'yes' ticked in the subscale and the denominator was the total of 'yes' and 'no' ticked in the subscale. For each subscale, if more than 50% of the items were not responded with 'yes' or 'no' answers, the response was considered invalid and the subscale score was not calculated. The total pass rate

**Table 1** Scoring instructions for the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA)**Objective**

The QUIPA tool is a patient-reported questionnaire used to assess patient perspectives on whether physiotherapists are providing evidence-based care when managing hip and/or knee osteoarthritis. It is a self-administered questionnaire consisting of 18 items divided into 3 subscales:

- Assessment and management planning: Q1–6
- Core recommended treatments: Q7–13b
- Adjunctive treatments: 14–17

The last 12 weeks is the time period considered when answering the questions.

**Method of use**

The QUIPA tool takes approximately 15 min to complete. For each question, tick ONLY 1 box corresponding to your response.

For question 10, if the answer was 'no', question 12 should be omitted and not answered.

For question 13a, if the answer was 'no', 'don't remember' or 'not overweight', question 13b should be omitted and not answered.

**Scoring instructions**

Each subscale score is calculated independently as below. Do not score if there is a missing response or if the response is in the grey columns.

For each subscale, if > 50% of the subscale items have not been responded with 'yes' or 'no' answers, the response is considered invalid and no subscale score should be calculated. For subscale Assessment and management planning, this means that 3 items must be answered; for Core recommended treatments, 4 items; and for Adjunctive treatments, 2 items must be answered in order to calculate a subscale score.

**Score (S) for each subscale:**

$$S = \frac{\text{Total of yes}}{\text{Total of yes/no}} \times 100\%$$

For the total score of the QUIPA tool, add up the responses from all 3 subscales as below.

**Total Score (ToS):**

$$\text{ToS} = \frac{\text{Total of yes from all 3 subscales}}{\text{Total of yes/no from all 3 subscales}} \times 100\%$$

**Interpreting the results**

The QUIPA tool is used to measure quality indicator pass rates for physiotherapists in managing hip/knee osteoarthritis. Percentage score is calculated, ranging from 0 to 100, with 100% representing the best quality of care score.

(%) of the QUIPA tool was calculated from all responses, where the numerator represented the total of 'yes' ticked on the tool, and the denominator was the total of 'yes' and 'no' ticked before the total score was normalized to 100. Percentage of score ranged from 0 to 100, with 100% representing the highest quality of care score.

**Phase 2: evaluation of the QUIPA tool****Characteristics of participants**

Of 90 eligible participants, 65 (72%) attended a physiotherapy consultation session. More than half were female (63%) and the mean (standard deviation) age was 64.5 (8.1) years. The majority of the participants (80%) had only knee OA, 15% had hip and knee OA, and 5% had only hip OA (Additional file 4).

**Characteristics of physiotherapists**

Of the 16 physiotherapists who expressed interest in the project, nine (four female) were selected based on clinical practice locations. More than half of the physiotherapists had ≤10 years of clinical experience, worked clinically ≥31 h weekly and saw ≥10 patients with hip and/or knee OA monthly (Additional file 5).

**Test-retest reliability**

Of the 65 participants who attended physiotherapy consultations, 63 (97%) completed the QUIPA tool within the specified timeframes for W12 and W13. The Kappa coefficients for individual QI items ranged from 0.30–0.83, with one demonstrating 'almost perfect' agreement, one 'substantial', thirteen 'moderate' and three 'fair' agreement [35] (Table 2). The percentage of observed agreement ranged from 64 to 94% and expected agreement ranged from 30 to 64%. Of the 63 participants, 23 reported being 'not overweight'. More than a third of the total participants selected 'no such problems' for QIs targeting OA subgroups i.e. item #14 walking aid ( $n = 23$ ), item #15 appliances and aids ( $n = 32$ ), item #16 work advice ( $n = 43$ ) and item #3 depression screening ( $n = 38$ ) at W12. The ICC (95% CI) for the Assessment and Management Planning subscale ( $n = 58$ ) was 0.70 (0.54, 0.81), Core Recommended Treatments subscale ( $n = 56$ ) was 0.84 (0.75, 0.90) and Adjunctive Treatments subscale ( $n = 20$ ) was 0.70 (0.39, 0.87). The ICC (95% CI) for the total score ( $n = 63$ ) was 0.80 (0.69, 0.88).

**Validity**

**Construct** Construct validity was considered acceptable with all three pre-defined hypotheses confirmed (Additional file 6).

**Agreement between treating physiotherapists and participants at W1** - The Kappa coefficients for individual QIs ranged from −0.04–0.59, with two demonstrating 'moderate', eight demonstrating 'fair' and six demonstrating 'slight' agreement [35]. The Kappa coefficients for two QIs were below 0 (Table 3). The percentage of observed agreement ranged from 46 to 86% and for expected agreement from 32 to 75%. The ICC (95% CI) for the Assessment and Management Planning subscale ( $n = 63$ ) was 0.20 (−0.05, 0.43), Core Recommended Treatments subscale ( $n = 65$ ) was 0.06 (−0.19, 0.29) and Adjunctive Treatments subscale ( $n = 21$ ) was 0.70 (0.39, 0.87). The ICC (95% CI) for the total score ( $n = 65$ ) was 0.11 (−0.14, 0.34).

**Pass rates for individual QIs** Additional file 7 and 8 show the pass rates for individual QIs as reported by physiotherapists and patients at Week 1 respectively.

**Table 2** Patient test-retest reliability for individual quality indicator at Week 12 and 13 ( $n = 63$ )

| Quality Indicators <sup>a</sup>            | Cohen's Kappa | 95% CI     | Observed agreement (%) | Expected agreement (%) |
|--------------------------------------------|---------------|------------|------------------------|------------------------|
| 1. Osteoarthritis assessment               | 0.38          | 0.11, 0.62 | 77.8                   | 64.3                   |
| 2. Comorbidities                           | 0.48          | 0.30, 0.65 | 68.3                   | 38.6                   |
| 3. Depression screening                    | 0.48          | 0.27, 0.65 | 68.3                   | 39.5                   |
| 4. Depression referral                     | 0.49          | 0.29, 0.70 | 76.2                   | 53.3                   |
| 5. Management plan                         | 0.33          | 0.10, 0.53 | 66.7                   | 50.2                   |
| 6. Physiotherapy review                    | 0.46          | 0.27, 0.63 | 71.4                   | 47.3                   |
| 7. Osteoarthritis definition               | 0.57          | 0.38, 0.74 | 74.6                   | 41.6                   |
| 8. Osteoarthritis pain                     | 0.54          | 0.32, 0.72 | 76.2                   | 48.7                   |
| 9. Treatment risk and benefits             | 0.53          | 0.35, 0.71 | 71.4                   | 39.7                   |
| 10. Exercise prescription                  | 0.83          | 0.67, 0.96 | 93.7                   | 62.5                   |
| 11. Exercise preference                    | 0.30          | 0.10, 0.50 | 63.5                   | 47.9                   |
| 12. Exercise adherence ( $n = 60$ )        | 0.54          | 0.36, 0.70 | 70.0                   | 35.0                   |
| 13. a. Benefits of weight loss             | 0.77          | 0.64, 0.90 | 84.1                   | 30.4                   |
| b. Strategies for weight loss ( $n = 19$ ) | 0.60          | 0.20, 0.90 | 78.9                   | 47.4                   |
| 14. Walking aid                            | 0.47          | 0.28, 0.66 | 66.7                   | 37.5                   |
| 15. Appliances and aids                    | 0.41          | 0.23, 0.58 | 66.7                   | 43.8                   |
| 16. Work advice                            | 0.41          | 0.17, 0.62 | 77.8                   | 62.4                   |
| 17. Footwear advice                        | 0.60          | 0.41, 0.75 | 74.6                   | 36.3                   |

95% CI: 95% confidence interval

 $n$  number of participants<sup>a</sup>The complete quality indicator corresponding to each number can be found in Additional file 10 Table S1**Table 3** Agreement between treating physiotherapists and participants ( $n = 65$ ) at Week 1 for individual quality indicator

| Quality Indicators <sup>a</sup>            | Cohen's Kappa | 95% CI     | Observed agreement (%) | Expected agreement (%) |
|--------------------------------------------|---------------|------------|------------------------|------------------------|
| 1. Osteoarthritis assessment               | 0.09          | -0.06-0.24 | 76.9                   | 74.6                   |
| 2. Comorbidities                           | 0.17          | -0.01-0.38 | 61.5                   | 53.5                   |
| 3. Depression screening                    | 0.21          | 0.04-0.40  | 69.2                   | 61.1                   |
| 4. Depression referral                     | 0.26          | 0-0.50     | 64.6                   | 52.0                   |
| 5. Management plan                         | -0.01         | -0.16-0.18 | 67.7                   | 68.0                   |
| 6. Physiotherapy review                    | 0.10          | -0.06-0.27 | 46.2                   | 39.9                   |
| 7. Osteoarthritis definition               | 0.36          | 0.12-0.59  | 73.8                   | 59.0                   |
| 8. Osteoarthritis pain                     | 0.25          | 0.03-0.46  | 66.2                   | 54.6                   |
| 9. Treatment risk and benefits             | -0.04         | -0.23-0.16 | 46.2                   | 48.1                   |
| 10. Exercise prescription                  | 0.29          | 0.07-0.48  | 75.4                   | 65.4                   |
| 11. Exercise preference                    | 0.09          | -0.12-0.32 | 72.3                   | 69.5                   |
| 12. Exercise adherence ( $n = 54$ )        | 0.23          | -0.02-0.45 | 59.3                   | 47.2                   |
| 13. a. Benefits of weight loss             | 0.30          | 0.13-0.46  | 52.3                   | 32.1                   |
| b. Strategies for weight loss ( $n = 14$ ) | 0.59          | 0-1        | 85.7                   | 65.7                   |
| 14. Walking aid                            | 0.37          | 0.17-0.55  | 61.5                   | 39.1                   |
| 15. Appliances and aids                    | 0.18          | -0.05-0.39 | 58.5                   | 49.6                   |
| 16. Work advice                            | 0.05          | -0.17-0.28 | 63.1                   | 61.3                   |
| 17. Footwear advice                        | 0.41          | 0.17-0.61  | 70.8                   | 50.7                   |

95% CI: 95% confidence interval

 $n$  number of participants<sup>a</sup>The complete quality indicator corresponding to each number can be found in Additional file 10 Table S1

## Discussion

This study developed a patient-reported QI tool to measure and benchmark physiotherapy care for people with hip and/or knee OA. A clinimetric evaluation of the QI tool was then performed to establish its reliability and validity in assessing physiotherapy care for this patient group.

Test-retest reliability for each subscale and total score of the QUIPA tool was acceptable (ICC of  $\geq 0.70$ ) although in most cases, the lower bound of the CIs was below 0.70, reflecting variability in the data and/or limited sample size. However, reliability for individual items varied. The item on exercise prescription (item #10) was the only QI that achieved 'almost perfect' agreement while the item relating to discussing the benefits of weight loss (item #13a) reached 'substantial' agreement. The better reliability of these two items compared to that of others suggests that it was easier for patients to understand their intent and to recall whether or not these aspects of physiotherapy care were provided.

Most of the other items ( $n = 13$ ) achieved 'moderate' agreement with three attaining 'fair' agreement. Ten achieved high observed agreement ( $> 70\%$ ) despite high variability in their Kappa estimates (as indicated by CI). This may be due to the statistical effect of a high or low prevalence of a specific answer for those items. High or low prevalence reduces Kappa estimates despite high observed agreement [36, 37]. For example, for the QI related to OA assessment (item #1), despite the high observed agreement (78%), the Kappa estimate (95% CI) = 0.38 (0.11, 0.62) is low due to high prevalence of 'yes' (53 out of 63) responses (leading to a high expected agreement). If agreement is expected to be high by chance, perhaps because most participants select the same value for an item, then even if observed agreement is high, Cohen's Kappa will be low. Conversely, for the QI related to OA pain (item #8), despite the observed agreement (76%) being comparable to item #1, the prevalence of 'yes' (34 out of 63) response resulted in a higher Kappa estimate (95% CI) = 0.54 (0.32, 0.72) (Additional file 9). The three items with the lowest Kappa estimates were related to OA assessment, management plan and exercise preference. Despite efforts to maximise specificity, these items likely remained ambiguous and could be interpreted differently across participants. Another potential reason for disagreement between test and retest scores was related to poor recall as we observed interchanges between "yes/no" and "don't remember" response options within an individual at W12 and W13. We deliberately chose a 3-month window when developing the QUIPA tool in order to capture multi-session episodes of physiotherapy care. Thus, we evaluated test-retest reliability of the tool at thirteen weeks, the period of maximum recall, in order to

establish reliability in the 'worst case' scenario. Reliability may be greater with shorter recall periods.

Overall, despite generally low Kappa values for single items of the QUIPA tool, the test-retest Kappa estimates and observed agreement were comparable [21] or only slightly lower [30] than previous patient-reported QI tools for OA care which have been rolled out and now used in practice. However, it must be noted that these studies used a recall time frame of 2 weeks for evaluating test-retest reliability despite the tools having a maximum recall period of 3 months [21, 30]. It is therefore not known whether the reliability estimates they reported would have been lower if they had used a three-month recall as we did.

In terms of validity, the QUIPA tool has acceptable construct validity with all three pre-defined hypotheses confirmed ( $P < 0.05$ ). These hypotheses were similar to those used for assessment of construct validity in other QI tools for OA care [21, 30], although the sample size in our subgroups was smaller. While construct validity was supported, our data indicate that the tool does not have acceptable criterion validity as assessed via comparison of participants' responses at W1 to responses provided by the physiotherapists.

The subscale scores, total scores and most of the individual items of the QUIPA tool achieved low agreement between participants and physiotherapists. Although the recall period for participants was shorter for validity testing, it is possible that treating physiotherapists might have delivered the care as described by the QIs, but participants might not remember receiving the care or misinterpreted the care received. Despite the consumer input to the development of the QI items, it appears that some items were ambiguous and likely to be interpreted differently, particularly from the perspective of a patient or a clinician. For example, for the item relating to review (item #6), a treating physiotherapist might suggest the participant see a physiotherapist for their hip and/or knee OA only when their symptoms flared up and would select the 'yes' response to this QI. For the participants, they might only select the 'yes' response if their treating physiotherapist proposed a specific date for their next physiotherapy review. It was also not clear for clinicians as to which responses to select if the participant voluntarily offered information relating to certain QIs without any promptings from their treating physiotherapist. Finally, for QIs that were not applicable to all participants (e.g. benefits of weight loss, walking aid, appliances and aids, work advice and depression referral), there were large inconsistencies between participants and their treating physiotherapists concerning whether the 'no' or the 'not overweight' / 'no such problems' option was selected. For the item relating to discussing the benefits of weight loss (item #13a), perceptions of overweight/obese

can also differ between the participant and their physiotherapist. Overall, it appears difficult to generate items that are unambiguous, interpreted in the same way by different users and capture all variations in provision of care.

#### Future directions

This study lays the groundwork for future refinement of the QUIPA tool, a patient-reported QI for benchmarking quality of physiotherapy care in hip and/or knee OA. Further refinement and re-evaluation are required to improve the validity of the QUIPA tool. Considerations for future refinements include a patient recall period shorter than 3 months, removal of ambiguous items, development of more comprehensive instructions to patients about what they should consider when answering the items and reduction of response options.

#### Strengths and limitations

This study has several strengths. The QIs were generated from an international physiotherapy consensus exercise [28] that used high-quality clinical guidelines for hip and knee OA [1, 29]. Other strengths include robust methodology to develop QIs (e.g. defined scope and purpose of the QIs, involvement of patients and physiotherapists, formulation of specific and measurable QIs [16, 38]) and good response rates to all surveys. In addition, no previous studies have comprehensively evaluated the validity of patient-reported QIs by assessing agreement between patients and their treating clinicians.

Despite achieving the recommended sample size for clinimetric testing, there was limited variation in the profiles of the participants. As such, we had few participants within subgroups such as those who were overweight, had problems with their walking, daily activities or work due to OA and with depression. Given these small sample sizes, and the aim of this work, we elected not to adjust for patient characteristics. Doing so may introduce bias and noise into our estimates of interest. In addition, during the course of this study, we were made aware of the use of pre-treatment 'registration' forms in some physiotherapy clinics, which may contain questions relating to the QIs. If information is collected via a form before a consultation rather than via a discussion during a consultation, this may lead to difficulties deciding how to answer the QUIPA items. Finally, despite attempts to increase variability in the data, the majority of the participants and treating physiotherapists chose 'yes' as their response options to the QIs.

#### Conclusion

In conclusion, this study developed the first patient-reported QI tool specifically to evaluate physiotherapy care for hip and/or knee OA. The QUIPA tool showed

acceptable test-retest reliability for subscales and total score but inadequate reliability for individual items. Construct validity was confirmed but criterion validity for individual items, subscales and the total score was inadequate. Further research is needed to refine the QUIPA tool to improve its clinimetric properties before it can be used to accurately assess quality of physiotherapy care for hip and/or knee OA.

#### Supplementary information

Supplementary information accompanies this paper at <https://doi.org/10.1186/s12891-020-08221-5>.

**Additional file 1.** The development of the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool.

**Additional file 2.** Excluded recommendations.

**Additional file 3.** Characteristics of participants in the focus groups.

**Additional file 4.** Characteristics of participants in the validation study.

**Additional file 5.** Characteristics of physiotherapists in the validation study.

**Additional file 6.** Construct validity analyses based on three predefined hypotheses.

**Additional file 7.** Pass rates for individual quality indicators reported by physiotherapists.

**Additional file 8.** Pass rates for individual quality indicators reported by patients at Week 1.

**Additional file 9.** Quality indicator example for statistical prevalence.

**Additional file 10.** The Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA).

#### Abbreviations

OA: Osteoarthritis; QUIPA: Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis; ICC: Intraclass correlation coefficient; QIs: Quality Indicators; UK: United Kingdom; W1: Week one; W12: Week twelve; W13: Week thirteen; W0: Post-consultation; BMI: Body mass index; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

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Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Melbourne.

#### Authors' contributions

PLT participated in study design, collection of the data, the analysis and interpretation of the data, and the drafting of the article. RSH, TE and KLB participated in the study design, data analysis and interpretation, and critical revisions of the manuscript. KSD participated in the study design and critical revisions of the manuscript. JK participated in the data analysis and interpretation, and critical revisions of the manuscript. All authors have read and approved the manuscript.

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**Availability of data and materials**

All data generated or analysed during this study are included in this published article [and its supplementary information files].

**Ethics approval and consent to participate**

The University of Melbourne Human Research Ethics Committee granted ethical approval for this study (Ethics ID: 1750532 & 1,750,925). Written informed consent was obtained from all participants.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare that they have no competing interests.

**Author details**

<sup>1</sup>Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, Melbourne, Victoria 3010, Australia. <sup>2</sup>School of Primary Community and Social Care, Keele University, Staffordshire, UK. <sup>3</sup>Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Australia.

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## **Chapter Five Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study**

Reprinted from Journal of Physiotherapy, Teo PL, Bennell KL, Lawford BJ, Egerton T, Dziedzic KS, Hinman RS, Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study. *Journal of Physiotherapy*. 2020; 66:256-265. Copyright, with permission from Journal of Physiotherapy, Elsevier (Appendix E).

Author contributions for this chapter are the following: PLT, KLB, KSD and RSH contributed to the study conception and design. PLT completed data collection. PLT, KLB, LBJ, TE, KSD and RSH contributed to the data analysis and interpretation of data. PLT wrote the first draft of the manuscript. All authors revised the paper and provided scientific input. All authors approved the final version of the manuscript.

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The QUIPA tool developed in Chapter Four is a quantitative instrument used to evaluate physiotherapy care for people with hip and/or knee OA. Therefore, Chapter Five is designed to qualitatively explore physiotherapy care for knee OA from the perspectives of the physiotherapists to gain a richer and deeper understanding than can

be gained from a QI tool. This Chapter aims to explore the experiences of Australian physiotherapists delivering care for people with knee OA and investigate the degree to which the reported experiences align with the OA of the Knee Clinical Care Standard.



## Research

## Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study

Pek Ling Teo<sup>a</sup>, Kim L Bennell<sup>a</sup>, Belinda J Lawford<sup>a</sup>, Thorlene Egerton<sup>a</sup>, Krysia S Dziedzic<sup>b</sup>, Rana S Hinman<sup>a</sup>

<sup>a</sup>Department of Physiotherapy, The University of Melbourne, Victoria, Australia; <sup>b</sup>School of Primary Community and Social Care, Keele University, Staffordshire, UK

## KEY WORDS

Qualitative research  
Physical therapy  
Knee osteoarthritis  
Quality of care  
Clinical guidelines  
Exercise  
Rehabilitation



## ABSTRACT

**Questions:** What are the experiences of physiotherapists delivering care for people with knee osteoarthritis? How do these experiences align with the national Clinical Care Standard? **Design:** A qualitative study using individual interviews. **Participants:** Twenty-two Australian physiotherapists (mean age 34 years, 50% female) with experience in providing care for people with knee osteoarthritis. **Methods:** Physiotherapists participated in semi-structured individual telephone interviews. Questions were informed by seven quality statements from the national Knee Osteoarthritis Clinical Care Standard. Thematic analysis was undertaken, with themes/subthemes inductively derived. Interview data were also deductively analysed according to the Clinical Care Standard. **Results:** Five themes emerged. First, physiotherapists focused on biomedical assessment with little psychosocial consideration. They managed 'mechanical' aspects of knee osteoarthritis, aiming to restore functional ability. Second, physiotherapists perceived their role as primarily providing goal-orientated personalised exercise via short-term episodic care. Knee surgery was considered a last option, but physiotherapists 'prepped' patients who decided on surgery. Third, clinical challenges included patient comorbidity, unsatisfactory patient adherence and a patient's desire for a 'quick fix'. The other two themes were: physiotherapists described a mismatch between what they know and what they do regarding imaging, weight management and manual therapy; and physiotherapists viewed weight loss, medication and surgical advice as outside of their professional role. **Conclusion:** Physiotherapists' reported experiences of delivering care for people with knee osteoarthritis were mostly consistent with the quality care standard. Care may be improved by increasing the focus on psychosocial aspects of care, offering longer-term reviews, and being more proactive with advice and/or referral regarding weight loss, pain medications and knee surgery. By describing the potential benefits and harms of common osteoarthritis medications and surgical interventions, physiotherapists will ensure that their patients are fully informed about all their treatment options. [Teo PL, Bennell KL, Lawford BJ, Egerton T, Dziedzic KS, Hinman RS (2020) Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study. *Journal of Physiotherapy* 66:256–265]

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## Introduction

Knee osteoarthritis (OA) is a major cause of joint pain and disability worldwide.<sup>1</sup> It is a major contributor to the OA burden and a common reason for knee replacement surgery.<sup>2</sup> Given that OA has no cure, and self-management with exercise and physical activity is a core recommended management strategy,<sup>1,3,4</sup> physiotherapists are important providers of care. As with all healthcare professionals, physiotherapists are responsible for ensuring that the OA care they provide is safe and aligns with best practice.<sup>5</sup>

To support delivery of high-quality evidence-based care to people with knee OA, and to minimise unhelpful variation, the Australian Commission on Safety and Quality in Health Care

developed an OA of the Knee Clinical Care Standard.<sup>6</sup> A Clinical Care Standard is a set of nationally agreed quality statements that describe key aspects of care that patients should be offered by health professionals and health services for a particular condition, according to current best evidence. The Clinical Care Standard for knee OA defines seven domains of care that people with knee OA should expect to receive, regardless of where they are treated in Australia. Under the expected quality care standard, a comprehensive assessment should include subjective and physical examination, along with an evaluation of psychosocial factors that may impact quality of life and participation in usual activities. Knee OA diagnosis should usually be based on clinical assessment alone, with imaging indicated only if an alternative

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diagnosis is suspected. Patients should be informed about OA and possible treatments, and provided with a personalised self-management plan. Patients who are overweight or obese should be supported to lose weight and encouraged to set weight and exercise goals. Patients with knee OA should be offered medication advice to help manage their symptoms and regular clinical reviews at agreed intervals. For patients with worsening knee OA symptoms, severe functional impairments and not responding to conservative management, they should be referred for specialist assessment and provided with appropriate information to inform their decision. If surgery is indicated and chosen, patients should be offered timely joint-preserving or replacement surgery. Finally, arthroscopic surgery should only be offered if patients have true mechanical knee locking.<sup>6</sup>

A recent systematic review investigating treatments provided by international physiotherapists for a range of musculoskeletal conditions found that only 65% provided evidence-based treatments to people with knee OA.<sup>7</sup> However, none of the studies in the review appraising care delivery for knee OA were conducted in Australia. A survey conducted in both Australia and New Zealand investigating the use of exercise adherence strategies amongst physiotherapists revealed that a third did not always prescribe exercises for people with knee OA.<sup>8</sup> It is believed that no qualitative studies have been conducted to explore Australian physiotherapists' experiences with delivering care to people with knee OA. Such information is important for identifying and understanding gaps in clinical practice and may help inform strategies to support practice improvement.

Therefore, the research questions for this qualitative study were:

1. What are the experiences of physiotherapists delivering care for people with knee osteoarthritis?
2. How do these experiences align with the national Clinical Care Standard?

## Method

### Design

A qualitative approach was employed, drawing from a constructivist paradigm. According to this paradigm, understanding and knowledge are built through active experience and interpretation, rather than objective measures.<sup>9</sup> The Consolidated Criteria for Reporting Qualitative Research checklist was used to ensure explicit and comprehensive reporting of this study.<sup>10</sup>

### Participants

Physiotherapists with experience providing care for people with knee OA were recruited from around Australia via Facebook advertisements. Purposive sampling was used to select from within the volunteers to achieve a sample spanning geographical locations, work situations, ages and genders.<sup>11</sup> Participants were required to be currently registered to practise in Australia and to have managed five or more people with knee OA via individual consultations over the prior 6 months. The final sample size was determined by the principle of data saturation.<sup>11</sup>

### Interviews

Semi-structured interviews were based on the OA of the Knee Clinical Care Standard (Table 1).<sup>6</sup> To minimise response bias, physiotherapists were not informed that a purpose of the study was to explore how their experiences delivering care aligned with the Care Standard. Instead, we conveyed our intention to explore their experiences in assessing, diagnosing and providing treatment options and follow-up appointments to patients with knee OA, along with the barriers they typically encountered in providing the care they

**Table 1**  
Semi-structured interview guide.

| Topic                         | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Introduction                  | 1) Can you tell me about your experiences treating patients with knee osteoarthritis? What are the main things that spring to mind?<br>• What prompts people with knee osteoarthritis to seek care from you?                                                                                                                                                                                                                                                                                                               |
| Comprehensive assessment      | 2) Could you talk through the assessment processes you typically go through with a patient who has knee osteoarthritis, when you first see them?<br>• What sort of questions do you normally ask in the assessment?<br>• What sort of physical assessment do you normally do?<br>• What do you think are the most important elements of your assessment of a patient with knee osteoarthritis?                                                                                                                             |
| Diagnosis                     | 3) How do you normally diagnose knee osteoarthritis?<br>• Are there any specific tests you use?<br>• When/why would you refer a patient for imaging to assist in diagnosis?                                                                                                                                                                                                                                                                                                                                                |
| Education and self-management | 4) Can you tell me about any information and advice you would typically give to a patient with knee osteoarthritis?<br>• What plan/strategies do you advise the patient regarding self-management?<br>• How do you identify the best self-management plan for your patient?<br>• How do you like to explain a diagnosis of osteoarthritis to the patient?                                                                                                                                                                  |
| Weight loss and exercise      | 5) Can you tell me about your approach to exercise management for your patients with knee osteoarthritis?<br>• How do you decide on which exercise program to advise for your patient?<br>• How do you help them/support them to adhere to their exercise program?<br><br>6) Can you tell me about your approach to weight loss management for your patients with knee osteoarthritis?<br>• Which patients do you talk about weight loss management with?<br>• How do you support those who are overweight to lose weight? |
| Medications                   | 7) Can you tell me about your approach to medicines/drugs for your patients with knee osteoarthritis? Can you tell me more about that?                                                                                                                                                                                                                                                                                                                                                                                     |
| Patient review                | 8) Can you tell me about your approach to reviews for a patient with knee osteoarthritis?<br>• How do you decide when to schedule appointments?<br>• How do you decide when to stop seeing the patient?<br><br>9) Which healthcare providers do you typically refer your patients to, if necessary? Can you tell me more about that?                                                                                                                                                                                       |
| Surgery                       | 10) Can you tell me about any surgical information/advice you typically give to a patient with knee osteoarthritis?<br>• Which patients do you talk about surgical treatments with?                                                                                                                                                                                                                                                                                                                                        |
| Concluding remarks            | 11) In general, what aspects of care do you like about managing people with knee osteoarthritis?<br><br>12) In general, what are the main challenges do you encounter when managing patients with knee osteoarthritis?<br><br>13) Are there any other aspects about providing physiotherapy care to people with knee osteoarthritis that you would like to discuss?                                                                                                                                                        |

thought was best. Physiotherapists were reimbursed for their time with a \$50 gift card.

Individual interviews were conducted via telephone by one investigator (PLT), a female physiotherapist and graduate research student trained in qualitative methodologies, who was otherwise unknown to each participant. Telephone interviews were chosen to facilitate participation of physiotherapists from all over Australia and to promote physiotherapists' perception of anonymity.<sup>12</sup> Interviews were audio recorded and transcribed verbatim by PLT or an external provider. Pseudonyms were assigned to participants for confidentiality.

### Data analysis

An inductive thematic approach was used to explore the experience of physiotherapists delivering care to people with knee OA.<sup>13</sup> PLT and another post-doctoral researcher (BJL) with expertise in qualitative methodologies (who is not a physiotherapist) individually read each transcript. They re-read and inductively coded each transcript to identify topics and initial patterns of emerging ideas. They then compared codes and grouped similar topics/ideas into categories. Thematic categories were organised into broader themes and sub-themes. The interview data were also deductively analysed according to each of the seven domains of care of the national Clinical Care Standard for knee OA. These were further reviewed by the broader research team (RSH, KLB and TE). To ensure data credibility and confirmability, the senior researcher (RSH) read all transcripts prior to discussion. Analysis was performed using standard word processing software.<sup>14</sup>

### Results

Table 2 describes the 22 physiotherapists who were interviewed. Half were female (50%) and the mean age was 34 years (SD 8, range 24 to 54). The physiotherapists worked primarily in private practice ( $n = 17$ , 77%), with most from major cities ( $n = 13$ , 59%), and some from inner regional ( $n = 5$ , 23%), outer regional ( $n = 3$ , 14%) or remote ( $n = 1$ , 5%) areas. No new themes arose in the final two interviews.

### Thematic analysis

Five themes emerged from the inductive analysis; they are outlined in Table 3 and described below.

#### Theme 1: Biomedical management with an aim to improve function

When assessing a person with knee OA, physiotherapists spoke about the need to identify signs and symptoms of OA and understand the nature of the person's knee pain. For many people, a diagnosis of OA had already been made by a doctor prior to referral. If a diagnosis was required, physiotherapists tended to focus on subjective reports of previous knee injuries, stiffness and pain, alongside consideration of the person's age. Physiotherapists emphasised the need to exclude serious pathology (including red flags) by using imaging and liked to have imaging to 'confirm' their diagnosis of OA. Physiotherapists conducted a comprehensive physical knee examination but infrequently assessed social supports and the psychological impacts of OA.

Physiotherapists tended to offer education that focused on self-management strategies for modifying load and thus addressing the

**Table 2**  
Characteristics of the physiotherapists ( $n = 22$ ).

| Pseudonym | Gender | Age (y) | Highest educational qualification  | Nature of practice    | State | Geographical location <sup>a</sup> | Years in practice | Clinical hours/week | Patients with knee OA seen per month | OA group program provided at practice |
|-----------|--------|---------|------------------------------------|-----------------------|-------|------------------------------------|-------------------|---------------------|--------------------------------------|---------------------------------------|
| Steve     | Male   | 29      | Masters (coursework)               | Private practice      | Vic   | Major city                         | 6 to 10           | 31 to 40            | ≤ 5                                  | None                                  |
| Ben       | Male   | 37      | Bachelors                          | Private practice      | WA    | Inner regional                     | 16 to 20          | 31 to 40            | 6 to 10                              | None                                  |
| Janet     | Female | 33      | Bachelors                          | Private practice      | NSW   | Inner regional                     | 6 to 10           | 11 to 20            | ≤ 5                                  | None                                  |
| Andy      | Male   | 32      | Masters (coursework)               | Tertiary hospital     | Vic   | Major city                         | 6 to 10           | 31 to 40            | ≥ 10                                 | None                                  |
| Ryan      | Male   | 30      | Masters (coursework)               | Private practice      | Vic   | Major city                         | < 5               | 40+                 | ≤ 5                                  | None                                  |
| Joseph    | Male   | 37      | Masters (coursework)               | Tertiary hospital     | Qld   | Major city                         | 11 to 15          | 31 to 40            | ≥ 10                                 | GLAD                                  |
| Beatrice  | Female | 27      | Postgraduate certificate/ diploma  | Private practice      | WA    | Major city                         | < 5               | 40+                 | ≥ 10                                 | None                                  |
| Jeremy    | Male   | 31      | Masters (coursework)               | Non-tertiary hospital | Vic   | Major city                         | 6 to 10           | 21 to 30            | ≤ 5                                  | None                                  |
| George    | Male   | 28      | Bachelors                          | Private practice      | Vic   | Major city                         | < 5               | 40+                 | 6 to 10                              | None                                  |
| Rachel    | Female | 47      | Masters (coursework)               | Private practice      | Vic   | Major city                         | 25+               | 31 to 40            | ≥ 10                                 | None                                  |
| Jean      | Female | 27      | Bachelors                          | Private practice      | NSW   | Inner regional                     | < 5               | 40+                 | 6 to 10                              | None                                  |
| Sharon    | Female | 36      | Post graduate certificate/ diploma | Private practice      | Vic   | Major city                         | 11 to 15          | 31 to 40            | ≤ 5                                  | Conditioning                          |
| Janice    | Female | 29      | Masters (coursework)               | Private practice      | NT    | Outer regional                     | 6 to 10           | 31 to 40            | ≤ 5                                  | None                                  |
| Alice     | Female | 54      | Bachelors                          | Private practice      | Vic   | Inner regional                     | 25+               | 21 to 30            | 6 to 10                              | GLAD                                  |
| Eric      | Male   | 25      | Masters (coursework)               | Private practice      | NT    | Remote                             | < 5               | 40+                 | ≤ 5                                  | None                                  |
| Sandra    | Female | 30      | Bachelors                          | Private practice      | NSW   | Outer regional                     | 6 to 10           | 11 to 20            | 6 to 10                              | OACCP                                 |
| Sandy     | Female | 24      | Bachelors                          | Private practice      | WA    | Inner regional                     | < 5               | 31 to 40            | ≤ 5                                  | None                                  |
| Gerri     | Female | 49      | Post graduate certificate/ diploma | Private practice      | SA    | Outer regional                     | 25+               | 21 to 30            | 6 to 10                              | None                                  |
| Michael   | Male   | 31      | Masters (coursework)               | Private practice      | NSW   | Major city                         | 6 to 10           | 40+                 | ≤ 5                                  | None                                  |
| Nathan    | Male   | 40      | Masters (research)                 | Tertiary hospital     | Qld   | Major city                         | 16 to 20          | 40+                 | ≥ 10                                 | None                                  |
| Mary      | Female | 43      | Masters (coursework)               | Private practice      | ACT   | Major city                         | 21 to 25          | 0 to 10             | ≤ 5                                  | None                                  |
| Nicholas  | Male   | 29      | Masters (coursework)               | Tertiary hospital     | NSW   | Major city                         | 6 to 10           | 31 to 40            | ≥ 10                                 | None                                  |

ACT = Australian Capital Territory, GLAD = Good Life with Osteoarthritis: Denmark, NSW = New South Wales, NT = Northern Territory, OA = Osteoarthritis, OACCP = Osteoarthritis Chronic Care Program, Qld = Queensland, SA = South Australia, Vic = Victoria, WA = Western Australia.

<sup>a</sup> Classification based on residential postcode, in accordance with Australian Standard Geographical Classification.

**Table 3**  
Themes, subthemes and quotes from the physiotherapist interviews.

| Theme 1: Biomedical management with an aim to improve function                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Biomedical approach to assessment</i>                                            | <p>Beatrice: 'Being more thorough with checking your red flags and looking at what's happening above and below the joint. Looking at the knee itself, ruling out any actual pathologies like ligament injuries or maybe it might be gout instead of OA, and you have to just take a good picture get the aggravating and easing factors and go from there.'</p> <p>Mary: 'I want to know where the pain is, whether it's confined to the knee or whether they're having problems in other areas... look at their range of motion, have a feel around the knee. Sometimes they've got stiff patella or stiff tibiofemoral joints. Sometimes their muscles around that area are tight or tender.'</p> <p>Eric: 'I generally just take a history of the person, their age, onset of symptoms, where their pain is in their knee, how long they've had pain in their knee, and to rule out other things that might be going on in the knee.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Biomechanical approach to pain management</i>                                    | <p>Jean: 'I guess load management is the big thing in that regard – what they're doing at home, and activities of daily living. If it's a housewife that likes to clean the house every day, giving instruction in regards to that: you shouldn't be doing any deep squatting, no kneeling. Trying to avoid anything that's going to load bear on the knee...'</p> <p>Mary: 'I tend to want people to understand about pacing, so pacing being fairly consistent from day to day how much activity you do so you don't have one day where you garden for five hours and then the next day where you sit on the couch for five hours – trying to think about breaking activity down over the course of a week so that it's fairly steady, and doing a little bit of activity and then changing activity, preferably not just resting.'</p> <p>Janice: 'If they have a reduction in knee flexion, I've found that there's some mobilisation techniques that you might use just to sort of increase flexion or extension movements there. Even if it's just to sort of get an immediate short-term pain benefit I think sometimes patella mobilisations or quads, soft tissue massage.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>'Wear and tear' language</i>                                                     | <p>Janet: 'Osteoarthritis is being a wear and tear problem with the joint and that a lot of the pain comes from the inflammation that goes along with that.'</p> <p>Steve: 'This is partly due to the wear and tear, so it's aging like your hair, like your nails; your joints do age.'</p> <p>Sandy: 'When I start to explain OA, is about "Over time, basically the joints start to wear down, usually from loading." It can be other factors but most of the time is from loading.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>Goal-orientated</i>                                                              | <p>Janice: 'Of course function, so what they can do, what they can't do and I guess what they'd like to be able to do. Because I guess that then gives you and them something to work for with regards to goal setting.'</p> <p>Mary: 'I usually dig around quite a bit to make sure I get a good picture of their normal activity levels and how that has changed from prior. And then I guess I want to know whether their goals are to get back to those or whether they have something else.'</p> <p>Gerry: 'Just about trying to work with what their needs are and what their goals are.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <i>Goal is to improve function</i>                                                  | <p>Janice: 'Functionality if they can sit to stand, if they can squat, if they walk up and down stairs, what their range of motion is like. I guess – yeah you want to try to as much as possible to tailor it to increasing their function, basically.'</p> <p>Nicholas: 'How far can they walk because that's the main limitation that most people with medium to high-grade knee osteoarthritis seem to have. So, if we can get a good measure of that then we can monitor that, reassess that, and reassess their improvements over time.'</p> <p>Ryan: 'Most important assessment in my opinion would be functional outcomes. So, depending on what they can do, because most of the time the OA knee patients, they come in, they come with a lot of pain, and you can't fix all of them, but then the most important thing is you want them to be able to achieve their own goal of being able to walk a little bit better, go out shopping.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Theme 2: Personalised programs with exercise at the heart of physiotherapists' care |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>Tailored exercise</i>                                                            | <p>Alice: 'Ask them what they are interested in – there is no point in telling someone to go to a pool and walk if they hate the water, hate bike riding, then they are not going to do it – find out what they are interested in, what worked for them in the past... Do they like group exercises or not? Are you better off if we create a program for you to do it at home?'</p> <p>Jean: 'So to start with, the non-weight bearing, so the exercise in the hydrotherapy pool, also – either lying or sitting VMO work – some active range of movement can be quite nice – as well if they've got some hamstring or calf tightness. When their symptoms start to decrease, progress to weight bearing whether it be terminal knee extension against the wall, pressing back with a ball, terminal knee extension with a resistance band – then into functional movements because that's what they're going to have to return to.'</p> <p>Steve: 'If weight-loss is a contributing factor then you're talking about referral to a dietician – plus talk to them about non-weight-bearing cardio exercises... I like cycling if the joint is happy for that bending and extension if that's not irritable, I'd probably start with cycling because it's less weight-bearing and then work on slowly progressing that.'</p>                                                                                                                                                                                                                                                                                                                          |
| <i>Episodic approach to care</i>                                                    | <p>Ryan: 'I'd typically get them in say twice a week for the first one or two weeks, depending on how bad they are, then I'd probably spread them out to once a week, or even like once a fortnight, if they are progressing well. When they've reached their goal, say pain free, get back to sports, or get back to whatever it is they used to be doing, then it's time to discharge.'</p> <p>George: 'If they need a bit of reassuring – I might see them a bit sooner. The ones that are more self-sufficient and able to manage things by themselves, I might review weekly or fortnightly or every couple of weeks. Once they've got a good programme going, maybe monthly. There's some that have no interest in doing any exercise classes but they're happy to manage things by themselves at home. They might be the one I see at first maybe every two weeks and then monthly after that. And then once they are happy with their symptoms and how things are progressing, I won't continue seeing them on a regular basis and I might just touch base via phone call.'</p> <p>Jean: 'Ok, day one. If I've given them something and I'm not sure whether they're going to cope with it or what the effect may be, I might see them again in seven days' time. And then if they're going well, I might give them another one or two things, and they'll go away and work on that for another three weeks or so. I usually review on a two to three weekly basis, and then if I'm happy that they're managing their programme, I might stem it out to a month review – when they've gotten back to their baseline, I'd be discharging.'</p> |

(Continued on next page)

Table 3 (Continued)

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Preparation for knee surgery</i>     | <p>Janice: 'They have a general practitioner or an orthopaedic specialist already who has booked them in for surgery or has decided that that's the path ahead. I'd still encourage them always to exercise even if obviously, they're going to have surgery, they're going to be pretty painful. They can try to get a little bit of weight loss before surgery knowing that they will benefit more and get more out of.'</p> <p>Mary: 'If I'm seeing someone who is already booked in for surgery, then I'll talk through the expectations of that surgery and the postop period. If someone's not booked in, I usually don't even raise the topic.'</p> <p>Jeremy: 'When clients come in with knee OA, often they're on the waiting list already for having a knee replacement. Not many of them would understand what the actual surgery is. We have pamphlets that actually explain what a knee replacement surgery is, and I'll go through that with them and expected timeframes for recovery.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Theme 3: Clinical challenges            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Comorbidities</i>                    | <p>Ryan: 'A lot of the time they have a lot of comorbidities, like I've got one who came in with fibromyalgia, knee OA, RA, and plus complex regional pain syndrome. These will all factor into pain. And yeah, it makes it a lot, lot harder to manage.'</p> <p>Geri: 'Probably the two main challenges would be co-existing comorbidities, so often they (are) overweight, or they also have cardiovascular disease. They may also have high cholesterol, high blood pressure.'</p> <p>Sharon: 'I'd imagine if I had obese people who weren't able to lose the weight that would be challenging. And I've had a few where it's just so advanced that they just can't do anything and especially like the very elderly where they just can't have surgery and they also have like so many comorbidities in regards to pain. That's challenging.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>Patient motivation and adherence</i> | <p>Nicholas: 'The main challenge we find is the actual compliance – the patients doing their exercises – How do we get this going on a long-term basis? How can we maintain? Yes, they've come and seen us in the last three months and improved a lot, but we can't keep seeing them for the next five, six, 10 years.'</p> <p>Geri: 'Well, one challenge here, where I live, is that it's very cold, and nobody likes to go outside for a walk. If they have had a fall, they can be very nervous about exercising alone, even to go for a walk, so there's that fear of falling. Fear of falling, the cold weather, they would be the key challenges.'</p> <p>Alice: 'I try and get them to have a routine, to visualise what time and day they will exercise, days they will do it, and what room they will do it in, so that they get a pattern. What type of equipment they will use, help them work that out so that they have got a definite plan rather than send them home and they are left with their own devices, so they are less likely to do it.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>Patient expectations</i>             | <p>Ben: 'Some people will just want a quick fix and if your message to them is that they have to manage their life, that they may have to lose weight, that they may have to exercise – people don't really take to that. They want the surgery, they want the pill. They want someone else to fix them.'</p> <p>Beatrice: 'They still just want the passive quick-fix treatment. They want me to chuck a machine on them. They want me to rub their leg and tell them everything's okay. And they don't want to own their condition.'</p> <p>Andy: 'That they have a preconceived expectation that surgery is the only option. They're not willing to change their opinion on the treatment that they need.'</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Theme 4: Knowing versus doing           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Imaging</i>                          | <p>Nathan: 'We never use imaging as a prime focus; we just look at the other scenarios such as range of motion limitations, effusion, swelling in their knees, their background, whether they have had a traumatic background or whether it's a gradual onset. Then if I have the capacity and the time and the ability to do it, then I'll normally order an x-ray just to double-confirm just to see if the imaging kind of guides what came out from the subjective assessment.'</p> <p>Sandy: 'I do find that even if I said what I think is going on in the knees are OA and explain it, a lot of the clients still go off to the doctor to get an imaging... I usually end up getting that sort of imaging once I have made the diagnosis as a support. [For example] 'joint line space degeneration in the knees' in that regard, the diagnosis that I have given in regard to OA in the knees has been right because they went and got imaging afterwards.'</p> <p>Jean: 'Often it's hard to convince them of the diagnosis without imaging, even though imaging isn't warranted necessarily in this patient group – they want that imaging done to confirm. And they're very hesitant to take your word for it that there's osteoarthritis there. They want that proof, they want to see visually, internally, that yes this is wear.'</p>                                                                                                                                                      |
| <i>Weight loss</i>                      | <p>Sandra: 'I do explain to them that the extra weight is putting extra force through their knee and so causing extra pain – I also ask them just vaguely – I touch on what they're actually eating throughout the day. And most people say 'oh I have a couple of bikkies at morning tea and then an ice cream for dessert' or something.' I just generally brush on 'Don't try and cut it all out but what if we just cut back to one bikkie instead of two and maybe half that bowl of ice cream, or every second day?'</p> <p>Janet: 'If patients report they are at a healthy weight, we talk about how important it is to maintain that healthy weight and getting diet and exercise to the right levels to do that... for patients whose BMI would be in the overweight range, we would help with their weight management at a physiotherapy level. We work out what activity they can do that doesn't increase their pain and symptoms, the duration and the intensity at which they can do that. We give them education about basically calories in versus calories out approach to weight loss...'</p> <p>Ryan: 'I will mention to them, it was each kilogram you lost and your weight will reduce 10%... usually they're quite sedentary, so start with some basic exercises like walking, or even a bit of cardio-type exercise or simple exercise at home, and give a little bit of advice in terms of diet – like drink plenty of water and a balance of green vegetables and meat...'</p> |
| <i>Manual therapy</i>                   | <p>Michael: 'There's not a lot of evidence long-term for manual therapy but I think it provides a small window that clients then feel a bit more at ease to move and more willing to exercise.'</p> <p>Mary: 'I do occasionally use manual therapy even though I know that's not evidenced based. But for the right client sometimes a bit of mobilising, patellofemoral or tibiofemoral joint or some soft tissue work – often the lateral distal quads are quite tight and uncomfortable and a bit of work around there can take some pressure off the knee. I'm very aware that that's not evidenced based, but I find in practice that it does work. I do that occasionally when it seems relevant.'</p> <p>Sharon: 'Many physios would absolutely kill me for this – but I still think that manual therapy with OA in the beginning is under-utilised. I think it's becoming a thing now to just started loading them – they respond so well to lots of good release work around their hip and knee and I just think that that whole element is being just sucked out of a physio; 'They don't need to be touched.' – I kind of disagree with that.'</p>                                                                                                                                                                                                                                                                                                                                            |

Table 3 (Continued)

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theme 5: It's not my job |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                          | Sandy: 'I do talk about the importance of weight, how the more you weigh, the more shock, and the more absorption it needs to be doing, but I don't push it too much, because I think that there are other health professionals who have a better way of approaching it compared to me.'                                                                                                                                                       |
|                          | Beatrice: 'I mean, I'm not a weight loss expert, I'm not a dietician, I'll often say to patients if they've got a high body mass index, weight is very much a contributing factor to their knee... Some simple things they can do is think about diet and exercise and go and have a chat to their general practitioner. If not, we can link them in with a dietician or nutritionist – if they need further help.'                            |
|                          | Janice: 'If their pain is not being managed well then generally I'll refer them back to the doctor to discuss if they need something stronger. We know that stronger opioid medications are probably not going to be of much use to them – but I don't generally give advice on what to take and what not to take. If we discuss it, I generally just advise them to run whatever they're thinking by a general practitioner or a pharmacist.' |
|                          | Jeremy: 'If they're struggling to bend the knee or find that everything's too irritable for them to start exercise, I might consider talking to their doctor. But I normally leave that to the doctors, I must say, rather than me giving advice with medicine because I feel that's a bit outside my scope of practice.'                                                                                                                      |
|                          | Nathan: 'We then refer them on to see the surgeons anyway – we leave the surgical advice to them and they've got all the necessary documentation for the patient to take home in terms of information sheets, et cetera... it's all sort of managed through them. But we generally tend to not step on that boundary if we can. We could but we don't.'                                                                                        |

'mechanical' aspects of knee OA (eg, pacing and activity modification to minimise knee overloading). Some used manual therapy to 'release tight knee structures'. There was little discussion about psychosocial influences on patients' experiences or how the physiotherapist might address these. Knee OA was perceived as a 'degenerative' process and the phrase 'wear and tear' was often used by physiotherapists to describe OA. Nevertheless, physiotherapists emphasised the importance of evaluating a patient's overall functional ability, with a view to determining functional goals rather than planning treatments that aimed for knee sign and symptom improvement. Although physiotherapists recognised that pain reduction was a desired goal for many patients, management plans incorporating exercise strategies predominantly aimed to restore or improve daily function.

#### **Theme 2: Personalised programs with exercise at the heart of physiotherapists' care**

Physiotherapists perceived exercise prescription to be their main role. They highlighted the importance of a tailored exercise program that considered individual physical ability, preferences, personal needs, affordability and/or accessibility to exercise facilities. Physiotherapists tended to provide episodic care, often comprising numerous individual consultations with or without group exercise classes over several months. The frequency and duration of consultations were individualised to a patient's response and preferences. Regular reviews were initially offered for a few weeks and gradually reduced as time progressed. An episode of care typically ceased when the patient had achieved the goals or symptoms had reduced. Some patients were referred for surgical consideration if little improvement had been observed with the treatment plan.

Physiotherapists considered knee surgery as the last option for knee OA and advised patients against surgery for as long as possible. While most physiotherapists felt that surgery was indicated for those with severe pain, restricted function and were refractory to conservative management, some described their role as 'prepping' patients for knee surgery when they were referred for physiotherapy. Surgical advice tended to focus on the preoperative and postoperative rehabilitation process, recovery time and possible surgical outcomes. Some physiotherapists said they avoided offering any surgical advice unless patients specifically asked for it.

#### **Theme 3: Clinical challenges**

Comorbidities (eg, overweight and obesity, cardiovascular disease, fibromyalgia, rheumatoid arthritis, complex regional pain syndrome) were described as a barrier to evidence-based management. Physiotherapists felt that patients with comorbidities often experienced more severe pain, hampering their ability to exercise or be physically

active. Some physiotherapists found it difficult to manage patients with comorbid obesity, particularly when a patient struggled to lose weight, despite attempts to do so.

A major challenge to achieving evidence-based management reported by most physiotherapists was the patients' unsatisfactory adherence to the exercise programs. Physiotherapists described both intrinsic barriers (eg, self-motivation, fear of falling, fear of pain) and extrinsic barriers (eg, costs, weather). Many reported implementing several strategies to boost adherence, including referring patients to supervised group exercise classes, providing exercise handouts, utilising exercise apps, and assisting patients to set an exercise routine.

Physiotherapists perceived that patient expectations can lead to challenges in delivering care, feeling that some patients with knee OA were not keen to participate in regular exercise or play an active role in managing their condition. Instead, physiotherapists believed that many patients desired a 'quick fix' for their pain, such as medications, 'hands-on' treatments or electrotherapy. Physiotherapists were frustrated by patients who deemed knee surgery to be the only solution.

#### **Theme 4: Knowing versus doing**

Whilst physiotherapists were generally aware of the research evidence regarding diagnosis and management of knee OA, they often described a mismatch between what they knew and what they did in practice. Numerous reasons were identified as contributors to these evidence-practice gaps, including meeting the patient's expectations of physiotherapy (eg, imaging for OA diagnosis), lack of confidence/knowledge/skill in implementing evidence into practice (eg, weight management) and personal beliefs/experience at odds with the evidence (eg, that some treatments such as manual therapy are beneficial). Although most physiotherapists were aware that an OA diagnosis could be made clinically without imaging, they relied on imaging as a safety net to confirm a clinical diagnosis. Some perceived imaging as the 'gold standard' for diagnosing OA.

Physiotherapists were aware that being overweight or obese was a risk factor for knee OA, and they generally believed that excess body weight had harmful biomechanical effects on the joint. Whilst they knew that losing weight was important for patients with knee OA who were overweight or obese, they predominantly provided education about why weight loss was important rather than advice about how to lose weight. Any advice was limited to brief general advice about healthy eating, energy expenditure and/or keeping active. Physiotherapists felt more comfortable encouraging physical activity for weight loss than recommending dietary strategies, and only a few described setting specific weight loss goals with their patients.

Some physiotherapists acknowledged the lack of evidence to support manual therapy for the management of knee OA. However, they discussed the benefits of 'hands-on' treatments to 'reduce

muscle tightness', 'improve joint flexibility' and provide short-term pain relief. Some used manual therapy as an adjunct to exercise.

#### **Theme 5: It's not my job**

Physiotherapists considered some elements of OA care to be outside their scope of practice, particularly weight loss, medication and surgical advice. Although most tended to mention weight loss in management discussions with patients who were overweight or obese, they felt that this aspect of the care was the role of a dietician. They favoured referring patients who needed to lose weight to other healthcare providers.

Similarly, physiotherapists did not see it as their role to provide medication advice, offering advice only when patients asked, and primarily focused on how to manage pain associated with exercising (with analgesics). Some physiotherapists suggested anti-inflammatories, natural supplements and/or intra-articular injections for knee pain, and a few advised against opioids. Most encouraged patients to consult their general practitioner or pharmacist for more information about medications.

Some believed it was not their role to advise the patient about knee surgery, opting not to discuss surgery at all. Surgical advice was deemed to be the responsibility of an orthopaedic surgeon. However, some physiotherapists were comfortable suggesting surgery to patients who responded poorly to conservative management. Physiotherapists typically advised patients against knee arthroscopy if specifically asked about this procedure.

#### **Alignment with Clinical Care Standard**

Table 4 derives from the deductive analysis and summarises how the knee OA care delivered by physiotherapists aligned with the Clinical Care Standard and highlights areas of discrepancy.

#### **Discussion**

This qualitative study explored physiotherapists' experiences with delivering care for people with knee OA and how they aligned with the national Clinical Care Standard for knee OA.<sup>6</sup> Inconsistent with the Clinical Care Standard, physiotherapists predominantly adopted a biomedical approach to assessment, with little consideration of psychosocial factors. Previous studies exploring physiotherapy management of knee OA have also found poor integration of psychosocial factors into physiotherapy practice.<sup>1,5,16</sup> This may reflect the nature of entry-to-practice training of physiotherapists, which tends to focus on a biomedical model and emphasises a diagnostic process to guide treatment.<sup>17</sup> Benefits of a biopsychosocial management approach are improved patient satisfaction with care and reduced likelihood of poorer health outcomes due to psychosocial influences.<sup>18,19</sup> Aligning with the Clinical Care Standard, physiotherapists tended to diagnose knee OA clinically but often utilised imaging to 'confirm' an OA diagnosis. Inappropriate use of imaging to diagnose OA is costly to the health system, and the language (eg, degeneration) used in describing imaging findings may reinforce the biomedical nature of OA in a patient's mind,<sup>20</sup> discouraging them from exercising due to fear of symptoms exacerbation.<sup>21</sup>

In agreement with the Clinical Care Standard, physiotherapists generally informed patients about what knee OA is. However, physiotherapists described OA pain as being caused by progressive joint degeneration, which is counter to contemporary beliefs about OA pathogenesis. Osteoarthritis is not a passive degenerative disease of cartilage but a whole-joint disease resulting from an imbalance between breakdown and repair of joint tissues. The chronic pain is also modulated by complex central factors.<sup>22</sup> Research has shown that when patients believe their joint is 'bone on bone' and caused by 'wear and tear', they are more likely to believe that physiotherapy and exercise will increase pain, making them more inclined to seek surgical or alternative treatments.<sup>21</sup> Inconsistent with the Clinical Care Standard, there was a general lack of advice provided around weight

loss strategies as well as the benefits and potential harms of medications and surgery for knee OA, primarily because physiotherapists felt that these aspects of care were not part of their professional role.

Aligning with the Clinical Care Standard, physiotherapists primarily supported self-management strategies that addressed the biomechanical aspects of knee OA but provided relatively little advice around psychological approaches to pain management.<sup>23</sup> These biomedical preferences for OA education and self-management were similar to findings from a study of physiotherapy management for knee OA in the United Kingdom.<sup>16</sup> Consistent with the Clinical Care Standard, physiotherapists in the current study tended to advise patients who were overweight or obese about the importance of weight loss for knee OA; however, they were reluctant to advise on concrete strategies for weight loss. These findings agree with other qualitative studies, which showed that physiotherapists lack confidence, knowledge and skills to conduct meaningful weight loss discussions with their patients.<sup>24,25</sup> With additional training, physiotherapists could potentially take a more active role in weight management to better advise and support their patients with knee OA to lose weight as part of a comprehensive management plan.

Physiotherapists focused on providing tailored exercise as core management, which agrees with the Clinical Care Standard. Previous studies have also shown that personalised exercise is the focus of physiotherapists when managing knee OA.<sup>8,15,16,25-28</sup> Physiotherapists felt that patient comorbidity and exercise adherence were the main challenges. Comorbidity is highly prevalent in patients with knee OA and is associated with increased pain, reduced function and greater activity limitations.<sup>29,30</sup> Some physiotherapists used manual therapy as an adjunct to help patients exercise or move better, even though they recognised the uncertainty in clinical practice guideline recommendations regarding its use for knee OA.<sup>4,31</sup> Although it is unclear what proportion of the consultation was devoted to manual techniques, it is important for physiotherapists to consider the 'opportunity cost' of manual therapy and ensure that it is not performed at the expense of exercise, education and self-management.

Physiotherapists tended to provide limited information about medication and preferred to refer patients to other health professionals for medication advice. This is likely because most physiotherapists are not licenced to prescribe medications<sup>32</sup> and have limited training in pharmacology,<sup>33</sup> and thus tended to view medication advice as outside of their scope of practice. Similarly, physiotherapists generally provided patients with limited information about surgical options. If they did discuss surgery, it was often related to their perceived role in providing 'prehabilitation' to patients undergoing knee replacement.<sup>34</sup> As physiotherapists are primary contact practitioners in Australia, it could be argued that physiotherapists should be able to describe the potential benefits and harms of common OA medications and surgical interventions to fully inform patients about their treatment options, so as to align with a philosophy of shared decision-making. Indeed, a core capability framework for clinicians managing people with OA specifies that all health professionals should understand the role of medications and surgical treatments used in managing OA.<sup>35</sup> Finally, aligning with the Clinical Care Standard, physiotherapists offered regular reviews to patients with knee OA; however, the reviews tended to be time limited and often over a short period. Regular reviews over longer-term periods (perhaps including 'booster sessions') may be beneficial to help increase patient adherence to exercise.<sup>36</sup>

A strength of this study is that we interviewed a range of physiotherapists, including males and females of different ages, work settings and geographical location across Australia. Physiotherapists were recruited from Facebook for this study. Thus, our data may be biased towards those who use a Facebook account and/or were more inclined to share their experiences. However, research shows that Facebook was the most popular social platform in Australia in 2019, with almost 83% of Australians accessing it monthly.<sup>37,38</sup> In addition, physiotherapists may have responded to interview questions in a socially desirable manner. Although efforts were made to reduce this effect by reassuring participants at the beginning of the interview that all views were respected, it is possible this study may have

**Table 4**  
Alignment of physiotherapy care with the national Clinical Care Standard for knee osteoarthritis (OA).

| Domains of care                | Key elements of care                                                                                                     | Physiotherapists' experiences with providing care                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comprehensive assessment       | Assess history of presenting symptoms and other health conditions                                                        | Physiotherapists generally assessed signs and symptoms of OA, nature of knee pain, mechanism of knee injury, mechanical features such as clicking, giving way and/or locking, aggravating and easing factors, 24-hour pain behaviour and comorbidities. They predominantly assessed patients' functional ability to determine their functional goals.                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                | Conduct a physical examination                                                                                           | Physiotherapists typically conducted observation of the knee, joint palpation, assessment of knee strength, range of motion and muscle length test, and observation of posture and gait. They also performed knee instability tests for ligamentous or meniscal injuries, and assessed other joints such as the spine, hip and/or ankle for any referred pain.                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                | Evaluate psychosocial factors                                                                                            | There was limited psychosocial assessment of people with knee OA. Physiotherapists infrequently enquired about patients' social support. Some were aware of patients' psychological needs but failed to address them adequately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Diagnosis                      | Diagnose knee OA clinically                                                                                              | Physiotherapists diagnosed knee OA based on subjective reports of previous knee injuries, stiffness and pain as well as consideration of the patient's age. However, many physiotherapists relied on imaging to 'confirm' their diagnosis of OA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                | Consider imaging for alternative diagnosis only                                                                          | Physiotherapists used imaging to rule out serious pathology (including red flags).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Education and self-management  | Provide education about knee OA and available treatments                                                                 | Physiotherapists described OA as a 'degenerative' process and used 'wear and tear' to describe OA. They offered education/self-management strategies to address the 'mechanical' aspects of knee OA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                | Individualised self-management plan based on physical and psychosocial needs                                             | Physiotherapists discussed an individualised self-management plan centred around the patients' knee symptoms and signs, functional ability and goals. Treatment plans focused on exercise and physical activity strategies. There was little consideration of patients' psychosocial needs when devising the self-management plan.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Weight loss and exercise       | Support patients who are overweight or obese to lose weight                                                              | Physiotherapists typically provided education around why weight loss was important (eg, less load on knees leading to reduced pain and improved function) to patients who are overweight or obese but did not often advise them on how to lose weight. When they did, they focused predominantly on exercise and physical activity rather than dietary strategies. Whilst some physiotherapists were comfortable discussing the importance of maintaining healthy weight with all patients, a few were reluctant to discuss weight loss unless patients brought it up themselves. They felt that weight loss was a 'sensitive' topic and raising it might risk patient rapport.                                                                                             |
|                                | Tailor exercise according to needs and preferences                                                                       | Most physiotherapists provided a tailored exercise program that considered individual physical ability, preferences, personal needs, affordability and/or accessibility to exercise facilities. Exercise settings included unsupervised home exercise programs, supervised group classes and land-based or water-based programs. Some physiotherapists were more inclined to offer supervised group classes to their patients to improve adherence. Exercises comprised strengthening, stretching, cardiovascular and functional programs and were progressed depending on functional ability and pain levels. Some provided manual therapy (eg joint mobilisation techniques, soft tissue massage and/or dry needling/acupuncture) as an adjunctive treatment to exercise. |
|                                | Establish weight and exercise goals, and refer to other services for assistance as required                              | Physiotherapists established personalised exercise goals with patients but rarely set specific weight loss goals. They preferred to refer patients who needed to lose weight to other healthcare providers (eg, general practitioner, dietician, nutritionist, bariatric specialists).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Medications to manage symptoms | Offer appropriate medicines to manage symptoms, considering clinical condition and preferences                           | Physiotherapists provided limited basic advice about using oral analgesics to manage pain associated with exercising. Some suggested anti-inflammatories, natural supplements and/or intra-articular injections for knee pain. Some discouraged opioid use. Whilst some physiotherapists reminded patients to adhere to the medication dosage as prescribed by their doctors, others encouraged patients to take the lowest dose possible. Physiotherapists preferred to encourage patients to consult their general practitioner or pharmacist for medication information as they did not see it as their professional role to provide medication advice.                                                                                                                  |
| Patient review                 | Agree on regular reviews according to the patient's needs                                                                | Physiotherapists provided relatively short-term 'episodes' of care to patients, comprised of individual consultations with or without group exercise sessions over a few months. They offered regular reviews initially for a few weeks and reduced the frequency as time progressed. Patients were discharged from care when they achieved their therapy goals, if their OA symptoms reduced or were referred for surgical opinion. Physiotherapists did not schedule reviews over the longer-term to monitor patient symptoms.                                                                                                                                                                                                                                            |
|                                | Refer to specialist if knee OA symptoms worsen and severe functional impairment persists despite conservative management | Physiotherapists generally referred patients for surgical consideration if they experienced severe knee pain, restricted function or when little improvement had been observed with therapy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Surgery                        | Offer timely joint surgery to patients not responding to conservative management                                         | Physiotherapists considered knee surgery as the last option for knee OA and advised patients against surgery for as long as possible. Knee surgery was indicated for patients who experienced severe knee pain, restricted function and were refractory to conservative management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                | Provide surgical information to inform treatment decision                                                                | Physiotherapists generally provided information about preoperative and postoperative rehabilitation processes, recovery time and possible surgical outcomes. They generally did not provide information on benefits/harms of surgery relative to other OA treatment options. Some physiotherapists believed that it was the role of an orthopaedic surgeon to educate the patient about knee surgery. Some believed their role was 'prepping' the patient for surgery.                                                                                                                                                                                                                                                                                                      |
|                                | Only offer arthroscopy to patients with true mechanical locking                                                          | Physiotherapists generally advised patients against knee arthroscopy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

over-represented the quality of care provided. Participating physiotherapists were predominantly working in private practice settings, so findings may not have been as generalisable to those working in hospital settings. Individual physiotherapists may wish to critically reflect on their own clinical practices, relative to the Clinical Care Standard, to consider if findings from this study apply to their own clinical interactions with patients presenting with knee OA.

#### Future directions

This study highlights several areas where physiotherapists could improve their care for people with knee OA. First, a more holistic approach to assessment appears warranted, incorporating psychosocial evaluation to ensure that psychosocial influences of OA on pain, physical dysfunction and quality of life are considered and comprehensively addressed. Physiotherapists may benefit from additional training in how to incorporate psychosocial and behaviour change elements into practice.<sup>19</sup> Second, physiotherapists should reconsider their use of imaging to confirm an OA diagnosis. Unnecessary imaging exposes patients to radiation, is costly to the health system, and may reinforce negative patient beliefs about OA.<sup>39</sup> Third, given the greater workforce capacity of physiotherapists relative to dietitians, it may be possible to upskill physiotherapists in the future to provide more comprehensive weight management advice,<sup>40</sup> including the skills to support patients embarking on a weight loss plan. Fourth, physiotherapists may need to carefully consider the use of manual therapy for knee OA management, given the conflicting clinical guideline recommendations for its use.<sup>4,31</sup> Finally, physiotherapists could consider regular reviews and monitoring of patients over the longer-term to allow for timely intervention and/or referral if the patients' condition changes. Regular monitoring allows physiotherapists to modify or progress exercise programs over time to provide sufficient physiological stimulus for health benefits and for adding variety to facilitate long-term adherence.

In conclusion, physiotherapists' reported experiences with delivering care for people with knee OA were mostly consistent with the quality care standard. Care may be improved by increasing the focus on psychosocial aspects of care and being more proactive with advice and/or referral regarding weight loss, pain medications and knee surgery. Physiotherapists should: describe the potential benefits and harms of common OA medications and surgical interventions, to ensure patients are fully informed about all their treatment options; and offer longer-term reviews, which may help increase patient adherence to exercise.

**What was already known on this topic:** Knee osteoarthritis is a major cause of joint pain and disability worldwide. Self-management with exercise and physical activity is a core recommended management strategy. To minimise unhelpful variation in care, the Australian Commission on Safety and Quality in Health Care developed an Osteoarthritis of the Knee Clinical Care Standard.

**What this study adds:** Physiotherapists reported care for people with knee osteoarthritis that was mostly consistent with the quality care standard. Care may be improved by increasing the psychosocial focus of care, offering longer-term reviews, and being more proactive with advice and/or referral regarding weight loss, pain medications and knee surgery.

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**Correspondence:** Rana Hinman, Department of Physiotherapy, The University of Melbourne, Melbourne, Australia. Email: ranash@unimelb.edu.au

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## **Chapter Six Patient experiences with physiotherapy for knee osteoarthritis in Australia – a qualitative study**

This manuscript is currently under review at BMJ Open, Teo PL, Bennell KL, Lawford BJ, Egerton T, Dziedzic KS, Hinman RS, Patient experiences with physiotherapy for knee osteoarthritis in Australia – a qualitative study. Submitted December 2020. Supplementary material (Appendix F).

Author contributions for this chapter are the following: PLT, KLB, KSD and RSH contributed to the study conception and design. PLT completed data collection. PLT, KLB, LBJ, TE, KSD and RSH contributed to the data analysis and interpretation of data. PLT wrote the first draft of the manuscript. All authors revised the paper and provided scientific input. All authors approved the final version of the manuscript.

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Having explored the experiences of Australian physiotherapists delivering OA care in Chapter Five, this Chapter aims to explore the experiences of people who had recently received physiotherapy care for their knee OA in Australia and investigate the degree to which the reported experiences align with the OA of the Knee Clinical Care Standard.

## **Patient experiences with physiotherapy for knee osteoarthritis in Australia – a qualitative study**

Pek Ling Teo, Kim L. Bennell, Belinda J. Lawford, Thorlene Egerton, Krysia S. Dziedzic and Rana S. Hinman

### **Abstract**

**Objective:** Physiotherapists commonly provide non-surgical care for people with knee osteoarthritis (OA). It is unknown if patients are receiving high-quality physiotherapy care for their knee OA. This study aimed to explore the experiences of people who had recently received physiotherapy care for their knee OA in Australia and how these experiences aligned with the national Clinical Care Standard for knee OA.

**Design:** Qualitative study using semi-structured individual telephone interviews and thematic analysis, where themes/subthemes were inductively derived. Questions were informed by seven quality statements of the OA of the Knee Clinical Care Standard. Interview data were also deductively analysed according to the Standard.

**Setting:** Participants were recruited from around Australia via Facebook and our research volunteer database.

**Participants:** Interviews were conducted with a sample of twenty-four people with recent experience (prior six months) receiving physiotherapy care for their knee OA in Australia. They were required to be aged 45 years or above, had activity-related knee pain and any knee-related morning stiffness lasted no longer than 30 minutes. Participants were excluded if they had self-reported inflammatory arthritis and/or had undergone knee replacement surgery for the affected knee.

**Results:** Six themes emerged. 1) Presented with a pre-existing osteoarthritis diagnosis (prior OA care from other health professionals; perception of adequate OA knowledge); 2) Wide variation in access and provision of physiotherapy care (referral pathways; funding models; individual vs group sessions); 3) Seeking physiotherapy care for pain and functional limitations (knee symptoms; functional problems); 4) Physiotherapy management focussed on function and exercise (assessment of function; various types

of exercises prescribed; surgery, medications, and injections are for doctors; adjunctive treatments); 5) Professional and personalized care (trust and/or confidence; personalized care); and 6) Physiotherapy to postpone or prepare for surgery.

**Conclusion:** Patients' experiences with receiving physiotherapy care for their knee OA were partly aligned with the Clinical Care Standard, particularly regarding comprehensive assessment, self-management, and exercise.

### **Strengths and limitations of this study**

- A strength of this study was using a qualitative design to explore how the experiences of people receiving physiotherapy care for knee OA in Australia aligned with the national Clinical Care Standard.
- A range of participants was interviewed, including males and females of differing age, occupational status, and geographical location across Australia.
- Participants responded to advertisements and/or email invitations to participate and thus our sample may be biased towards those who had favourable experiences with physiotherapy and/or were successful at accessing physiotherapy.
- Our sample was constrained to participants who could speak English so may not represent the experiences of people from culturally and linguistically diverse backgrounds.
- Physiotherapists are a primary contact health profession in Australia so patient experiences with physiotherapy care for knee OA may be different in other countries where people can only access a physiotherapist on referral.

## 6.1 Introduction

Knee osteoarthritis (OA) is highly prevalent and a leading cause of pain and disability worldwide.<sup>1</sup> Clinical guidelines advocate non-surgical interventions such as exercise, weight loss (for people who are overweight or obese) and education regarding self-management as first line treatments for knee OA,<sup>1-3</sup> Physiotherapists are important providers of non-surgical care for people with knee OA and receive more OA referrals from general practitioners than other allied health providers.<sup>4</sup> In addition, patients generally perceive physiotherapists to be important to assist them in managing their OA and prescribing exercises.<sup>5, 6</sup>

To date, there are indications that physiotherapy care provided to people with knee OA may not necessarily align with evidence-based care standards. We recently conducted a qualitative study to explore the experiences of Australian physiotherapists delivering care for people with knee OA and how their experiences aligned with the national Clinical Care Standard.<sup>7</sup> The Clinical Care Standard for knee OA defines seven key aspects of care that people with knee OA should expect to receive in Australia.<sup>8</sup> We found physiotherapists tended to rely on biomedically-oriented assessment and would often provide treatment (such as manual therapy) and self-management strategies that aimed to address the ‘mechanical’ aspects of knee OA. The primary focus for physiotherapists was to provide goal-orientated personalised exercise. Surgery was perceived as a last resort, and patient comorbidity, adherence, and desire for a ‘quick fix’ were the main clinical challenges experienced. Physiotherapists also described a mismatch between what they knew and what they did when it came to imaging, weight management and manual therapy. Weight loss, medication and surgical advice were perceived to be outside of their scope of practice. Nevertheless, physiotherapists’ reported experiences were mostly consistent with the quality care standard.<sup>7</sup> Findings from this study provide useful information about physiotherapy management of people with knee OA but it can be argued that a patient’s perspective of their physiotherapy care experiences may not necessarily be similar to that of the therapist.

Several qualitative studies have explored patient experiences of receiving care for their knee OA from either a multidisciplinary team which included physiotherapists<sup>9-14</sup> or solely from physiotherapists.<sup>15-19</sup> However, none of these studies have specifically explored patient experiences receiving physiotherapy assessment, diagnosis, treatment

options and follow-up appointments for their knee OA. This study is complementary to our previous similar qualitative study with physiotherapists as participants.<sup>7</sup> In the present study, we aim to explore the experiences of Australians who had recently received physiotherapy care for their knee OA and how these experiences aligned with the national Clinical Care Standard for knee OA. Such information will help enhance our understanding of patient experiences with physiotherapy care for their condition and may help inform strategies to improve future care and service delivery.

## **6.2 Method**

### **6.2.1 Design**

This qualitative study used semi-structured interviews and was based on a constructivist paradigm, where knowledge is built through active experience and interpretation.<sup>11</sup> Qualitative methods allow for in-depth examination of the attitudes, experiences, and behaviours of individuals in their natural context and can contribute to a broader understanding of medical research.<sup>23-25</sup> The Standards for Reporting Qualitative Research checklist was used to ensure explicit and comprehensive reporting of this study.<sup>12</sup>

### **6.2.2 Patient and public involvement**

Patients or the public were not actively involved in the design, conduct, reporting or dissemination plans of our research.

### **6.2.3 Participants**

A convenience sample of adults who had sought physiotherapy care to manage their knee OA were recruited from around Australia via Facebook and our research volunteer database. Inclusion criteria for participants were: i) met the National Institute for Health and Care Excellence OA clinical criteria<sup>1</sup> (aged 45 years or above, had activity-related knee pain and any knee-related morning stiffness lasted no longer than 30 minutes); and ii) consulted a physiotherapist about their knee OA in the prior 6 months. Participants were excluded if they had self-reported inflammatory arthritis and/or had undergone knee replacement surgery for the affected knee. The final sample size was determined by the principles of data saturation, this being when no new themes emerged from the data.<sup>13</sup> Participants provided written informed consent and ethical approval was granted by the School of Health Sciences Human Ethics Advisory Group,

University of Melbourne. Interviews were conducted between December 2019 and January 2020.

#### 6.2.4 Interviews

Semi-structured interview guides (Table 1) were developed, informed by the quality statements of the Australian Government's OA of the Knee Clinical Care Standard.<sup>14</sup> It defines seven domains of care that people with knee OA should expect to receive, regardless of where they are treated in Australia, spanning comprehensive assessment, diagnosis, education and self-management, weight loss and exercise, medications, regular review and surgical options for people with knee OA. Participants were reimbursed for their time with a \$50 gift card.

**Table 1: Semi-structured interview guide.**

| Topic                                  | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>                    | 1) Can you tell me about your experiences attending physiotherapy for your knee osteoarthritis? <ul style="list-style-type: none"> <li>What prompted you to seek physiotherapy care?</li> </ul>                                                                                                                                                                                                                                                                                                                                       |
|                                        | 2) Can you tell me, where did you see the physiotherapist(s)? <ul style="list-style-type: none"> <li>How did you end up seeing a physiotherapist?</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Comprehensive assessment</b>        | 3) Can you tell me how the physiotherapist assessed you and your knee problem? <ul style="list-style-type: none"> <li>What sort of questions did the physiotherapist ask you?</li> <li>What sort of physical examination did the physiotherapist do?</li> <li>What other health conditions or social factors that might affect how you manage your knee pain (for example, changing work) did the physiotherapist assess?</li> <li>What sort of questionnaire, survey or form did the physiotherapist ask you to complete?</li> </ul> |
|                                        | 4) What was the main problem you were seeing the physiotherapist for? <ul style="list-style-type: none"> <li>How well did the physiotherapist understand the main problems you were experiencing for your knee?</li> </ul>                                                                                                                                                                                                                                                                                                            |
| <b>Diagnosis</b>                       | 5) How did the physiotherapist decide that you have knee osteoarthritis? <ul style="list-style-type: none"> <li>What sort of tests or scans did the physiotherapist order for your knee osteoarthritis?</li> <li>How did the physiotherapist explain/help you to understand your diagnosis?</li> </ul>                                                                                                                                                                                                                                |
|                                        | 6) What sort of treatments did the physiotherapist give you for your knee osteoarthritis? <ul style="list-style-type: none"> <li>Can you tell me if the physiotherapist provided you with any hands-on treatment or used any machine/device on your knee?</li> <li>Can you tell me if the physiotherapist advised you on the use of knee brace, walking aid or taping for your knee problem?</li> </ul>                                                                                                                               |
| <b>Education &amp; self-management</b> | 7) Can you tell me what you remember about any information/advice you received from the physiotherapist for your knee osteoarthritis?                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                        | 8) What exercise did the physiotherapist suggest you try? <ul style="list-style-type: none"> <li>How did the physiotherapist consider your needs and preferences when deciding on the best exercise program for you?</li> </ul>                                                                                                                                                                                                                                                                                                       |
| <b>Weight loss &amp; exercise</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                           |                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | 9) Could you tell me if weight is an issue for you? If so, what weight loss treatment did the physiotherapist suggest you try?                                                                                                                                                                                                                                             |
|                           | 10) Can you tell me if the physiotherapist discussed with you the importance of maintaining healthy body weight for your knee osteoarthritis?                                                                                                                                                                                                                              |
| <b>Medications</b>        | 11) Can you tell me if you are taking any medications to manage your knee osteoarthritis? <ul style="list-style-type: none"> <li>○ <i>Can you tell me if you asked the physiotherapist ways to manage your medications?</i></li> <li>○ <i>Is there a reason why you didn't ask the physiotherapist about medications for your knee?</i></li> </ul>                         |
|                           | 12) What information/advice did the physiotherapist provide about medicines/drugs for your knee osteoarthritis? <ul style="list-style-type: none"> <li>○ <i>Can you tell me if the physiotherapist spoke about any injection you could get for your knee?</i></li> </ul>                                                                                                   |
|                           | 13) Can you tell me how often you saw the physiotherapist for your knee problems? <ul style="list-style-type: none"> <li>○ <i>How many times did you see the physiotherapist for you knee?</i></li> <li>○ <i>How frequently do you see the physiotherapist now?</i></li> <li>○ <i>What did the physiotherapist advise you to do if your problems get worse?</i></li> </ul> |
| <b>Patient review</b>     | 14) Which other health professional did the physiotherapist recommend you see for your knee problem? <ul style="list-style-type: none"> <li>○ <i>How did you go with the recommendation?</i></li> </ul>                                                                                                                                                                    |
|                           | 15) Can you tell me if you have considered any sort of surgery for your knee osteoarthritis? <ul style="list-style-type: none"> <li>○ <i>Can you tell me if the physiotherapist asked you about your thoughts of having any knee surgery?</i></li> </ul>                                                                                                                   |
|                           | 16) What information/advice did the physiotherapist provide about surgical treatments for your knee osteoarthritis?                                                                                                                                                                                                                                                        |
| <b>Surgery</b>            | 17) Is there any other aspect about your physiotherapy care you would like to discuss?                                                                                                                                                                                                                                                                                     |
|                           | 18) Do you have anything else to add?                                                                                                                                                                                                                                                                                                                                      |
| <b>Concluding remarks</b> |                                                                                                                                                                                                                                                                                                                                                                            |

Individual interviews were conducted via telephone by PLT, a female graduate research student and physical therapist trained in qualitative methodologies. Telephone interviews were conducted to facilitate participation of people with knee OA from Australia (irrespective of geographical location) and to promote a perception of anonymity in interviewees.<sup>15</sup> Interview questions were refined following the first three phone interviews to improve clarity for participants based on experience from the initial interviews. The refinement also helped to enhance/expand the prompts to ensure rich information were collected from the participants. Interviews were audio recorded and transcribed verbatim by an external provider.

### 6.2.5 Data analysis

An inductive thematic approach was used initially.<sup>16</sup> In order to minimise over-representation, two researchers conducted the data analysis simultaneously. Following Morse et al's approach to inductive thematic analysis (which advocates for four steps:

1) read and re-read interview transcripts; 2) step back and reflect on interviews as a whole; 3) identify ideas of similar nature 4) group ideas into themes),<sup>29</sup> firstly, the student researcher (PLT) and another post-doctoral researcher (BJL) with expertise in qualitative methodologies (and who is not a physiotherapist) individually read each transcript. Next, they re-read and inductively coded each transcript to identify topics and initial patterns of emerging ideas. They then compared codes and grouped similar topics/ideas into categories before organising them into broader themes and sub-themes. The interview data were also deductively analysed according to the national Clinical Care Standard for knee OA. These were further reviewed and discussed with the broader research team (RSH, KLB, TE). The senior researcher (RSH) read all transcripts prior to discussion to ensure data credibility and confirmability. Analysis was performed using standard word processing software.<sup>17</sup>

### 6.3 Results

Seventy-six participants responded to the interview invitation but only 31 fulfilled the eligibility criteria for this study. Of the 31 eligible participants, 24 completed the interview while the remaining either declined participation or were not contactable. Table 2 describes the 24 participants interviewed. Three-quarters were female, and the mean (standard deviation) age was 64 (10) years (range 49 to 81). Participants resided in all of Australia's six states and two territories. Most lived in major cities (79%), with some from outer regional (13%) or inner regional areas (8%). Most (67%) people reported less than five sessions of physiotherapy for their knee OA in the prior 6 months, some (25%) between five to nine and two (8%) reported ten or more sessions.

**Table 2: Characteristics of the patients (n=24).**

|                               | Mean (SD) or n (%) |
|-------------------------------|--------------------|
| <b>Female</b>                 | 18 (75%)           |
| <b>Age (years)</b>            | 63.5 (9.8)         |
| <b>State</b>                  |                    |
| -Australian Capital Territory | 2 (8%)             |
| -New South Wales              | 5 (21%)            |
| -Northern Territory           | 1 (4%)             |
| -Queensland                   | 2 (8%)             |

|                                                       |             |
|-------------------------------------------------------|-------------|
| -South Australia                                      | 2 (8%)      |
| -Tasmania                                             | 1 (4%)      |
| -Victoria                                             | 8 (33%)     |
| -Western Australia                                    | 3 (13%)     |
| <b>Geographical location*</b>                         |             |
| -Major cities                                         | 19 (79%)    |
| -Inner regional                                       | 2 (8%)      |
| -Outer regional                                       | 3 (13%)     |
| <b>Education level</b>                                |             |
| -Three years or more of high school                   | 5 (21%)     |
| -Some tertiary training                               | 5 (21%)     |
| -Graduated from university or polytechnic             | 7 (29%)     |
| -Any post-graduate study                              | 7 (29%)     |
| <b>Work status</b>                                    |             |
| -Work full-time                                       | 3 (13%)     |
| -Work part-time                                       | 7 (29%)     |
| -Unable to work due to health reasons                 | 3 (13%)     |
| -Retired (not due to health reasons)                  | 11 (46%)    |
| <b>Knee pain severity<sup>†</sup></b>                 | 5.7 (1.9)   |
| <b>Pain (WOMAC)<sup>‡</sup></b>                       | 6.8 (3.0)   |
| <b>Physical function (WOMAC)<sup>‡</sup></b>          | 22.1 (10.5) |
| <b>Number of physiotherapy sessions<sup>§</sup></b>   |             |
| -4 or less                                            | 16 (67%)    |
| -5 to 9                                               | 6 (25%)     |
| -10 or more                                           | 2 (8%)      |
| <b>Number of physiotherapist(s) seen<sup>  </sup></b> | 1.1 (0.3)   |

SD: standard deviation

n: number of participants

\*Classification based on residential postcode, in accordance with Australian Standard Geographical Classification.

<sup>†</sup> Measured by 11-point numeric rating scale (0 = no pain, 10 = worst pain possible), where patients rated the average amount of their knee pain over the past week.

<sup>‡</sup> Measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), where pain scores range from 0 to 20 and physical function scores range from 0 to 68 (higher scores indicate worse pain/poorer function).

<sup>§</sup> Number of physiotherapy sessions attended by patient for their knee osteoarthritis over the last six months

<sup>||</sup> Number of physiotherapist(s) consulted by patient for their knee osteoarthritis over the last six months

Six themes emerged following the inductive thematic analysis.<sup>29</sup> An audit trail of evidence showing examples of each stage of the data analysis is presented in Supplementary file 1. The six themes identified are outlined in Table 3 and described below.

**Table 3: Themes, subthemes and exemplary quotes from the patient interviews.**

| <b>Theme 1: Presented with a pre-existing osteoarthritis diagnosis</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Prior OA care from other health professionals</i>                         | <p>Male, 76 years: "I got my MRI scan and I took it back to the doctor and it showed that I had osteoarthritis, that it was very inflamed, that my cruciate ligament resembled a celery stick and he got me to go to see the physio."</p> <p>Male, 75 years: "My knees got really bad about last July and I went to see a surgeon with the possible view of having replacements done. The diagnosis for both knees were bone on bone. He didn't feel that I was severe enough to warrant surgery at that time, so on further discussion, he suggested that I go to physiotherapy to strengthen my legs. So, I went to a local physiotherapist."</p> <p>Female, 76 years: "I've had the experience with the osteoarthritis for about eight or nine years and first of all, I went to a knee specialist and then I went to a sports medicine specialist and orthopaedic surgeon. I did that for about eight or nine years and recently, I've been to a physiotherapist for the Good Life with osteoarthritis: Denmark (GLA:D) program*."</p>                                                                                                |
| <i>Perception of adequate OA knowledge</i>                                   | <p>Female, 49 years: "I think I have a fairly good understanding of what osteoarthritis is. I understand that I have damage to the articular cartilage of my kneecap and medial femoral condyle. I have very little cartilage at all and that's rubbing. To be honest, I didn't need him [the physiotherapist] to explain all of that."</p> <p>Male, 70 years: "The physiotherapist saw the x-rays and they have training in interpreting x-rays like that for degenerative bone disease such as osteoarthritis, cartilage wear and things like that. I was well aware that I had osteoarthritis, so I don't think he did anything to explain the osteoarthritis because I was fairly well aware of what it was on about."</p> <p>Male, 60 years: "It's just basically wear and tear, and it's really bone on bone. The surgeon explained it to me, too. He sat me down with him at his computer looking at the MRI. It's little fragments of bone and stuff that are rubbing against each other and disintegration of your bone in your patella plus around your knee. Because there's no blood flow in that area, it doesn't heal."</p> |
| <b>Theme 2: Wide variation in access and provision of physiotherapy care</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>Referral pathways</i>                                                     | <p>Male, 56 years: "Initially I went to the orthopaedic surgeon and it was deemed that surgery is inappropriate at the moment because of age and probably not severe enough to warrant a replacement. I [was referred by the surgeon to] the osteoarthritis [chronic care program]. The [osteoarthritis] chronic care program<sup>†</sup> was really an intermediary or, hopefully, a step to prevent requiring a knee replacement as such."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                | Female, 49 years: "I mentioned to my doctor I'm getting these sore knees, she said, you should try Kieser <sup>‡</sup> . I knew it was up the road, my friend went there, and my doctor said it could be a good idea."                                                                                                                                                                                                                                                                               |
|                                                                                | Female, 55 years: "I just chose them [the physiotherapy centre] because I knew they did Pilates and exercise rehab, so that's why I went there. And they were close to home."                                                                                                                                                                                                                                                                                                                        |
|                                                                                | Male, 72 years: "My doctor recommendation. I got on this Enhanced Primary Care Plan <sup>§</sup> where they recommend a physiotherapist."                                                                                                                                                                                                                                                                                                                                                            |
| <i>Funding models</i>                                                          | Female, 60 years: "I had an accident at work a few years ago. I suffered quite a bit of pain and I was referred to a specialist, and he did an arthroscopy. Then I was doing follow-up physiotherapy after the arthroscopy. The surgeon did another arthroscopy and I followed up with more physiotherapy - and started doing hydrotherapy under a physiotherapist. I was doing those sessions on a regular basis. WorkCover then ceased to cover me, and so I was doing them myself out-of-pocket." |
|                                                                                | Female, 69 years: "I went to my general practitioner and got the five treatments that you can get from the government for chronic illness. [With] the care plan you only get five treatments, but then I've got private health insurance, so I saw him under that as well."                                                                                                                                                                                                                          |
|                                                                                | Female, 69 years: "I had ancillary benefits at that stage and I only got about five treatments covered by that ancillary benefits with Medibank Private. I couldn't afford the ancillary benefits anymore so, no, I won't go to a physio now."                                                                                                                                                                                                                                                       |
| <i>Individual vs group sessions</i>                                            | Female, 69 years: "The most recent physio visit was with a new physio because I was having a bicycle fit, and as part of the bike fit the physio did a full-on assessment so he talked more about osteoarthritis as well. I've only seen him once."                                                                                                                                                                                                                                                  |
|                                                                                | Female, 55 years: "I didn't see an individual physio for individual sessions in the last six months. I was always in group sessions. It's a general fitness class but it's mainly for menopausal age group. So, everyone has their own set of problems. It's not tailored just for one problem; it's tailored for everyone."                                                                                                                                                                         |
|                                                                                | Male, 75 years: "I went to a local physiotherapist and they did sort of two sessions of assessment. And then I started going to regular weekly classes."                                                                                                                                                                                                                                                                                                                                             |
|                                                                                | Female, 79 years: "Recently this year, I've been to a physiotherapist for the GLA:D* program. As part of the GLA:D* program, we had to do an education program and so she [the physiotherapist] showed us a diagram of the knee and explained how different things get worn out and rough. There were six different exercises in the GLA:D* program."                                                                                                                                                |
| <b>Theme 3: Seeking physiotherapy care for pain and functional limitations</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <i>Knee symptoms</i>                                                           | Female, 49 years: "My knees were becoming sorer and clicking as I walked, particularly up sets of stairs. And I have a lot of stairs at work. So, I thought I need to go and talk to a physio about it."                                                                                                                                                                                                                                                                                             |
|                                                                                | Female, 51 years: "I had an ongoing knee problem and the pain was just killing me. I would be in tears with the pain. I went to the doctor; they were giving me anti-inflammatory tablets, they were not working. So, I said is there anything I can do, will physio help, and the doctor sent a referral to the physio."                                                                                                                                                                            |

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|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                            | Female, 55 years: "Well, it was for knee pain that I wanted to go and build-up the strength in my legs to try and avoid surgery. I've lost capacity to squat and things like that; I've lost a lot of strength in my right leg and my legs have become quite bowed."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>Functional problems</i>                                                 | <p>Female, 69 years: "I think she understood what my concerns were that I couldn't get upstairs. I couldn't drive the car because of the clutch and the knee pain. She looked at all those things and helped me with them."</p> <p>Female, 81 years: "I told her [the physiotherapist] that my foot turns in. I also told her that my knee crunches. I can manage the pain but going up and down stairs is one of the problems that I've got."</p> <p>Male, 72 years: "Well I told him [the physiotherapist], I said, look, I just want to get back surfing properly and snowboarding and skiing. I said I realise I'm 72 years old and it's not going to be easy and they said, oh no, no problem we can do it."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Theme 4: Physiotherapy management focussed on function and exercise</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <i>Assessment of function</i>                                              | <p>Male, 56 years: "Timing or just observing, getting in and out of a chair. Walking a set distance, I think it might have been like 100 metres and they time that. And then, there was going up and down stairs and they had some sort of a measurement with that. Then, over time would repeat that and see if there was any improvement."</p> <p>Female, 49 years: "He watched me from a seated position to standing. He looked at my movements. We went out the back and I did a lot of walking up and down, and they had a staircase of about three or four steps, and he watched where the pain happened there. He had me practicing, in particular, the way I walk up and down stairs to make sure that through my feet, I was balancing the weight and not throwing to one side."</p> <p>Male, 75 years: "They were measuring how far I could bend my legs laying down and standing up. Squats. Doing steps. They found that I was bending knees. I wasn't walking correctly, but I was doing that to relieve the pain. They got me stepping up correctly with a straight leg. I think she made a record of all of her findings and then set these exercises to hopefully relieve some of the pain and strengthen my leg muscles."</p> |
| <i>Various types of exercises prescribed</i>                               | <p>Female, 49 years: "He gave me an exercise program, just some gentle swinging of the knee initially, and then I built it up to other types of exercise. He had me practicing the way I walk up and down stairs, then we looked at me doing some kicking, gentle kicking with the board and gentle deep water running as opposed to doing the structured classes."</p> <p>Male, 75 years: "Other than exercise machines that they had in-house, there was elastic stretching band and she told me to do elliptical trainer at home and a cycle machine. I've got a list here. Its straight leg raise, bridging, clams, ball squeezes, sit to stand, lunges, calf raises ballet style, step-ups, go on the bike, and balance exercise."</p> <p>Female, 55 years: "I was doing Pilates, then I was doing Fit-Right classes. We did lots of clams with weights and off-weights. I did a lot of [reformer] where I sat on a spring-loaded box."</p>                                                                                                                                                                                                                                                                                               |
| <i>Surgery, medications, and injections</i>                                | <p>Male, 56 years: "I think it's the rheumatologist or my general practitioner who would be issuing the drugs so I didn't think that would be physio. I don't think meds ever really was their [the physiotherapists'] jurisdiction."</p> <p>Male, 72 years: "The physio doesn't want to go into the drug side of it because of the risks. Why would he change it as regards something as serious as drugs? I'd had second</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>are for doctors</i>                             | thoughts and the fact that I thought they'd [a surgeon] done the wrong knee. He didn't go into that because obviously that's not part of his remit."                                                                                                                                                                                                                                                                                                        |
|                                                    | Female, 69 years: "The surgeon will know better about how advanced it is and I've got a lot of faith in him. He can give me a better idea of where I should proceed after this. Because I've had it before, I have got a fairly good idea of what the process will be."                                                                                                                                                                                     |
| <i>Adjunctive treatments</i>                       | Male, 76 years: "I couldn't bend the knee very well; I was in real pain and he gave me a couple of needle sessions both hot and dry needles. He massaged the knee; he did a lot to try and bend the knee."                                                                                                                                                                                                                                                  |
|                                                    | Male, 60 years: "It's a little bit of ultrasound, but basically manipulation. I'm always tight in the hamstring. I play lawn bowls, and if it was niggly, I drop in the physio and say listen, could you tape my knee for me, please, and they do it for me straight away."                                                                                                                                                                                 |
|                                                    | Female, 69 years: "I did get a bit of massage and a trigger point treatment to help alleviate that. We also tried, I think it's called EMS machine, an electronic stimulation machine, to try and build the muscle at one point because my kneecap was so aggravated."                                                                                                                                                                                      |
| <b>Theme 5: Professional and personalized care</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <i>Trust and/or confidence</i>                     | Male, 76 years: "I thought he was excellent. He was one of the best physiotherapists I've ever seen in my life. His approach to everything, his care. Many of them can be in and out, I'm finished with you, I've only got so much time for you. None of that. He was extremely good, and I had complete trust in what he was doing. And when he did hurt me it wasn't because he wanted to hurt me, he said, oh I'm sorry and tell me if that's too hard." |
|                                                    | Female, 69 years: "I thought she was really good. I think she understood what my concerns were that I couldn't get upstairs. I couldn't drive the car because of the clutch and the knee pain. She looked at all those things and helped me with them."                                                                                                                                                                                                     |
|                                                    | Female, 69 years: "When he gave them to me, they all seemed quite logical because I know nothing, I wouldn't know what was good or bad for me. I trusted him because I had the condition before when my knee was bad. He also knew my background and what I'd been through, so that was good to have that kind of long-term relationship."                                                                                                                  |
| <i>Personalized care</i>                           | Female, 51 years: "I had a good say in it because every time she suggested something she would ask. With appointment times, she would always check, 'Is this a good time for you?' Every time she suggested a treatment, she would ask me. She was always checking back with me."                                                                                                                                                                           |
|                                                    | Female, 49 years: "I think he has a very good understanding of my knee problem and I think he understands that better than my doctors, because he's worked side by side with me, he's supported me, it's more intimate. He's been keen to help resolve the problems, rather than doing, what I call a supermarket shelf, one size fits all program. He's really worked hard to try and work out what's best in my circumstance."                            |
|                                                    | Female, 49 years: "I also went to a gym called Kieser which is – I call it the sausage factory of physiotherapy. The person who started the program for me was a physiotherapist and guided that program, but I guess I didn't feel that really was addressing my issues. It was building my core strength, but it wasn't really helping my knees."                                                                                                         |
|                                                    | Female, 57 years: "My physiotherapist knows me well. I've been seeing him for some time, he seems to know where my problems lie. He spent the time to look at other areas                                                                                                                                                                                                                                                                                   |

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which because of my osteoarthritis in my knee, I was having problems with. So at least he looked at all those areas, so I was happy with that. He came up with a few suggestions on how he would approach it, and then we went from there.”

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**Theme 6: Physiotherapy to postpone or prepare for surgery**

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Female, 60 years: “I was told by my surgeon a few years ago that it would be likely I would need a knee replacement. They don’t like to do it until it’s absolutely necessary. He kept telling me I was too young. They like to wait until you’re so old you might die under the knife or you don’t get long enough to enjoy the freedom of your new knee.”

Female, 69 years: “We were talking about the advantages of doing it [surgery] sooner than later, but then he’s [the physiotherapist] saying if I do it a bit later then we can strengthen the muscles in my knee and around my knee, that will make maybe recovery quicker.””

Female, 60 years: “I’m on a waiting list to have a knee replacement. We know that the waiting list is fairly long, so I’ll keep myself as healthy and fit as I possibly can, so that I’m able to get through this okay.”

Male, 70 years: “Things like osteoarthritis and physiotherapy, there is only so much that physiotherapy can do. If it’s bone on bone that doesn’t replace the cartilage. All that physiotherapy can do is prescribe activities and exercises to help ameliorate the impact of the osteoarthritis because osteoarthritis doesn’t go away. I’ve had arthroscopies on my knees, so there’s no cartilage there. But I’m reluctant to have knee replacements.”

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\*Good Life with Osteoarthritis: Denmark (GLA:D) is an education and exercise program developed in Denmark for people with hip/knee osteoarthritis. The program has been adapted and delivered by physiotherapists in Australia and comprises of an initial assessment, twelve supervised group exercise sessions, two group education sessions and a follow-up assessment.<sup>19</sup>

†The Osteoarthritis Chronic Care Program (OACCP) is a multidisciplinary model of care developed in New South Wales, Australia for people with hip/knee osteoarthritis, specifically those awaiting elective joint replacement surgery. The program is a public-health initiative in tertiary hospitals and offers conservative management, including programs for exercise and weight loss, self-management advice, psychological and pharmacological reviews and disease management education.<sup>18</sup>

‡Kieser is a strength training program using specific equipment and was originally developed in Switzerland. The program was adapted and delivered by physiotherapists in Australia in Kieser training centres.<sup>20</sup>

§The Enhanced Primary Care Plan is a former term for a program now called a Chronic Disease Management Plan, which is a Medicare subsidised program enabling general practitioners to refer patients with a chronic medical condition to a maximum of five allied health services (including physiotherapists) per calendar year.<sup>21</sup>

*Theme 1: Presented with a pre-existing OA diagnosis*

Participants tended to have a diagnosis of knee OA already made by a doctor prior to their physiotherapy consultation and did not seek physiotherapists to take on a diagnostic role. They often brought knee imaging results with them to the

physiotherapy consultation. Some expected physiotherapists to access imaging results from their general practitioners. Participants described a range of other health professionals they had consulted for their knee problems before consulting a physiotherapist, such as a general practitioner, rheumatologist, orthopaedic surgeon and/or sports medicine physician.

Participants generally perceived their pre-existing knowledge and understanding about OA to be adequate. They had typically acquired their knowledge from personal experience and/or from conversations with healthcare professionals prior to them seeking physiotherapy care. Often, knowledge about OA was constructed from imaging (e.g. x-ray) results. Participants often described their OA with phrases such as ‘wear and tear’, ‘bone on bone’, ‘degenerative’ and/or ‘cartilage wear’.

*Theme 2: Wide variation in access and provision of physiotherapy care*

Participants accessed physiotherapy through a variety of care models, including consultations at private physiotherapy practices, participation in programs specifically developed for OA management delivered in the public (e.g. Osteoarthritis Chronic Care Program<sup>18</sup>) and private (Good Life with Osteoarthritis Denmark (GLA:D<sup>19</sup>) healthcare settings, participation in more generic strengthening-based programs (e.g. Kieser<sup>20</sup>), hydrotherapy and/or generic exercise classes (e.g. Pilates/gym). Most were referred by their general practitioners or other medical specialists but some “self-referred” to a local physiotherapist. Participants chose their physiotherapist by convenience (e.g. physiotherapist located in the same medical practice as their general practitioner or located close to home), by following a recommendation from their friend or doctor, or based on prior experience (e.g. previously consulted the physiotherapist for other musculoskeletal conditions and/or their knee problem).

Participant attendance at physiotherapy services often relied on funding being available to subsidise cost of care. Some participants described accessing physiotherapy in public hospital settings (e.g., Osteoarthritis Chronic Care Program<sup>18</sup>), some received Medicare rebates for physiotherapy services in the private sector (e.g., via Chronic Disease Management Plans<sup>21</sup>), whilst others were subsidised through their private health insurance or other regulatory body (such as worker compensation schemes). A few

participants paid out-of-pocket to cover their physiotherapy costs. Participants often ceased their physiotherapy visits because funding ran out.

Participants received physiotherapy care via individual consultations and/or via group sessions. Some participants attended one-on-one consultations several times before transitioning to a group setting. Most described undergoing an individual assessment with the physiotherapist, including those who ultimately participated in group classes. People referred to physiotherapy under the Chronic Disease Management Plan typically attended individual physiotherapy sessions up to five times.

### *Theme 3: Seeking physiotherapy care for pain and functional limitations*

Participants spoke about their knee symptoms as a major driver of seeking care, including ongoing knee pain, swelling, clicking and muscle weakness. They expressed frustration with the pain they experienced, particularly when it made them unable to move the knee or walk properly. Words such as ‘click’, ‘crunch’ or ‘crack’ were commonly used to describe other symptoms. Participants spoke about feeling weak around their knees, which caused their knee to ‘give way’ or ‘collapse’. Participants also sought care because of difficulties with functional activities such as walking, driving, getting in/out of the bed/chair/toilet/shower, negotiating steps and squatting. Some participants avoided doing sports/recreational activities (e.g. cycling, surfing, running, swimming) for fear of exacerbating pain. Many people expected physiotherapists to provide treatments to relieve the pain and assist with building knee strength, as well as helping them to return to activities they previously enjoyed or were now unable to do.

### *Theme 4: Physiotherapist management focused on function and exercise*

The physiotherapist typically assessed functional ability, including walking, squatting, getting in/out of a chair, and negotiating stairs. Some participants were timed when performing functional tests, and others were asked to repeat the tests as they progressed through their treatment sessions. Participants consistently described exercise as a key component of their physiotherapy consultations. They received advice about different types of exercises for their OA, including strengthening, cardiovascular, stretching, balance and functional movement programs. Some participants were instructed to use exercise equipment such as elastic resistance bands and/or weights to progress the

intensity of the exercises. For those who were given home exercise programs, exercise handouts or online instructions were provided. Some participants also attended supervised group exercise classes such as gym or fitness-based program, Pilates, hydrotherapy, balance and/or strengthening classes.

Participants tended not to expect information about surgery, medications and knee injections from their physiotherapist, instead considering these domains of care as a doctor's responsibility. Many did not see the need for physiotherapists to cover these options further and some participants felt that physiotherapists should refrain from providing any medication advice because they do not have prescription rights.

Some participants received adjunctive treatments from physiotherapists such as massage, dry needling/acupuncture and manual knee mobilisation techniques to relieve muscle tightness and joint stiffness. Transcutaneous electrical nerve stimulation and electronic muscle stimulator machines were sometimes provided to relieve knee pain and stimulate muscles respectively. Other common adjunctive treatments offered by physiotherapists included ultrasound, heat/cold pack, taping and using a knee brace. These were typically delivered during individual physiotherapy consultations.

#### *Theme 5: Professional and personalized care*

Generally, most participants were happy and satisfied with the physiotherapy care they received. Some described having trust in their physiotherapists, both in their clinical skills and professional knowledge when managing knee OA. Most felt that their physiotherapist understood and appreciated the problems they were experiencing, and some were impressed that the physiotherapist was able to identify what was 'going on' with their knees. Participants were also confident that their physiotherapists could help them by providing practical advice and/or strategies to overcome their specific problems.

Participants valued the highly personalised care they received and felt that physiotherapists generally provided care that was tailored to their needs. They spoke about their physiotherapist as being empathetic and understanding towards their condition/circumstances. Some felt that their physiotherapist 'knew them well', which enabled the physiotherapist to provide the care and support they desired/needed. Others highlighted the value of working collaboratively with their physiotherapist and

appreciated having a ‘two-way discussion’, where the participant was asked for their input in devising a treatment plan for their OA. When care was not personalised, participants expressed a sense of disappointment, describing the treatment received as a ‘sausage factory’, ‘supermarket shelf’, or being a ‘one size fits all program’.

*Theme 6: Physiotherapy to postpone or prepare for surgery*

Participants perceived that joint replacement surgery was inevitable for their knee problems. Many were informed of this by their doctor and some were already on hospital waiting lists for surgery. However, participants were also advised by their doctors/surgeons to delay surgery for as long as possible and some attended the physiotherapist in an effort to achieve this. Participants generally believed that physiotherapists were not able to ‘cure’ OA but could help in reducing its impact. Some described the role of physiotherapy as providing them with strategies to strengthen the knees and alleviate their OA symptoms in order to delay surgery. Whilst some participants ‘prepared’ their knee for surgery by seeing a physiotherapist, others were keen to have surgery as soon as possible.

***Alignment with Clinical Care Standard for knee osteoarthritis***

Deductive analysis was used to generate Table 4, which summarises how participant experiences of physiotherapy care for knee OA aligned with the Clinical Care Standard.

**Table 4: Alignment of participant experiences of physiotherapy care with the national Clinical Care Standard for knee osteoarthritis (OA).**

| Domains of care                 | Key elements of care                                              | Patient experiences receiving care                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Comprehensive assessment</b> | Assess history of presenting symptoms and other health conditions | Patients expected their physiotherapists to provide treatments for relief of knee pain, to strengthen muscles and to return them to activities they previously enjoyed or were now unable to do.                                                                                               |
|                                 | Conduct a physical examination                                    | Patients described being typically assessed for functional ability (e.g., walking, squatting, getting in/out of a chair, negotiating stairs). Some were timed when performing functional tests, and others were asked to repeat the tests as they progressed through their treatment sessions. |
|                                 | Evaluate psychosocial factors                                     | Patients rarely described any psychosocial evaluation by their physiotherapist.                                                                                                                                                                                                                |
| <b>Diagnosis</b>                | Diagnose knee OA clinically                                       | Patients generally had received a knee OA diagnosis from their doctor prior to seeing their physiotherapist. They often had knee imaging                                                                                                                                                       |

|                                       |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | Consider imaging for alternative diagnosis only                                                                          | <p>results to bring to their physiotherapy consultations.</p> <p>Patients did not touch on this aspect as they typically went to their physiotherapist with imaging results from their doctor.</p>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Education and self-management</b>  | Provide education about knee OA and available treatments                                                                 | Patients perceived they had adequate pre-existing knowledge and understanding about OA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                       | Individualized self-management plan based on physical and psychosocial needs                                             | Patients felt that their physiotherapist generally provided care that was tailored to their needs. Patients rarely mentioned any psychosocial considerations when discussing self-management plans with the physiotherapist.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Weight loss and exercise</b>       | Support people who are overweight or obese to lose weight                                                                | Some patients did not perceive their weight as an issue. For those with weight problems, some described having a discussion with their physiotherapist about the importance of weight loss/maintenance.                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                       | Tailor exercise according to needs and preferences                                                                       | Patients received advice about various exercises (e.g., strengthening, cardiovascular, stretching, balance, functional movement programs) for their OA. Some used elastic resistance bands and/or weights for exercises. Some attended supervised group exercise classes (e.g., gym or fitness-based program, Pilates, hydrotherapy, balance, strengthening classes). Some also received adjunctive treatments (e.g., massage, dry needling/acupuncture, manual techniques, transcutaneous electrical nerve stimulation, electronic muscle stimulator machines, ultrasound, heat/cold pack, and taping). |
|                                       | Establish weight and exercise goals, and refer to other services for assistance as required                              | Exercise goals and programs were routinely established with physiotherapists. Patients rarely described establishing weight loss goals or being referred to other healthcare providers for weight loss support.                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Medications to manage symptoms</b> | Offer appropriate medicines to manage symptoms, considering clinical condition and preferences                           | Patients did not expect information about medications and knee injections from their physiotherapist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Patient review</b>                 | Agree on regular reviews according to patient's needs                                                                    | Patient attendance at physiotherapy services often relied on funding being available to subsidise cost of care. Reviews would often cease when funding ran out.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                       | Refer to specialist if knee OA symptoms worsen and severe functional impairment persists despite conservative management | Patients generally sought care from a physiotherapist to postpone, or prepare for, knee surgery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Surgery</b>                        | Offer timely joint surgery to patients not responding                                                                    | Patients generally sought care from a physiotherapist to postpone, or prepare for, knee surgery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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|                                                                 |                                                                                    |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------|
| to conservative management                                      |                                                                                    |
| Provide surgical information to inform treatment decision       | Patients did not expect information about knee surgery from their physiotherapist. |
| Only offer arthroscopy to patients with true mechanical locking | Patients rarely mentioned discussing knee arthroscopy with their physiotherapist.  |

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## 6.4 Discussion

This qualitative study explored experiences of people who had received physiotherapy care for their knee OA in Australia and how they aligned with the national Clinical Care Standard for knee OA. Participants within this study valued physiotherapists' ability to provide professional and personalized care and described having a strong sense of trust and/or confidence in their physiotherapist. They also felt that physiotherapists understood their problems. These findings are consistent with previous research, which showed that patient satisfaction with physiotherapy care for a range of musculoskeletal conditions was generally high in Australia and other countries such as those in Northern Europe, North America, the United Kingdom and Ireland.<sup>22</sup> Physiotherapists' interpersonal and communication skills are important attributes to high patient satisfaction.<sup>22</sup> Our findings suggest that, generally, patients within this study perceived Australian physiotherapists work in a patient-centred way to ensure that patients' treatment expectations, needs and preferences are respected. Such care aligned with the Clinical Care Standard relating to self-management, where patients received management plan that suited their needs and preferences. These findings were also similar to our previous study with physiotherapists,<sup>7</sup> who described offering an individualised self-management plan based on knee symptoms and signs, functional ability and goals.

Participants utilised various referral pathways and a range of different funding models to access physiotherapy care through a diverse array of service delivery options. This suggests that there is not a single 'one size fits all' model of physiotherapy care that will suit the needs and individual circumstances of all Australians living with knee OA. Our findings highlight how important it is for healthcare systems to offer different models of physiotherapy care, in both the public and private sectors, for example, spanning individual consultations through to group exercise classes. This helps to

reduce inequity of access to physiotherapy care for people with knee OA, which may arise from geographical location or socioeconomic status.<sup>23</sup> Indeed, a community-based survey of 1000 people with arthritis in Australia found that over two thirds of respondents felt that they did not cope well with their condition because of the health care they experienced, and felt that they had poor access to medical doctors, specialists and allied health professionals.<sup>24</sup> Allowing patients the flexibility to choose which type of physiotherapy service best suits their needs, preferences and financial situation also aligns with a philosophy of patient-centred care,<sup>25, 26</sup> and permits the patient to have some control over their own health care.

Our findings highlight how reliant people with knee OA are on government-funded health care and/or third-party payers (such as private health insurers) to fund their physiotherapy care. Participants predominantly accessed and received care from physiotherapists in private practice settings and typically ceased physiotherapy when funding ran out and they were required to pay out-of-pocket for services. These findings are consistent with key Australian policy documents, including the National Osteoarthritis Strategy,<sup>27</sup> that have called for expansion of funding to support OA care delivery, including care delivered by physiotherapists.<sup>28</sup> Given the chronicity of knee OA, regular reviews and follow-up are advocated to allow for monitoring of symptoms, permit timely changes to management, and to support effective self-management.<sup>1</sup> However, similar to a previous study in Australia,<sup>29</sup> the costs associated with physiotherapy treatments were identified by our participants as an important barrier to continuing to access physiotherapy care for OA. Our findings highlight the importance of funding mechanisms for physiotherapy services to relieve the financial burden that people experience when accessing necessary care for knee OA. Therefore, it remains unclear if patients were offered regular reviews by their physiotherapist, as recommended by the Clinical Care Standard, due to lack of funding being a potential barrier to regular reviews.

Although pain was one of the important drivers of care-seeking in our participants, many also desired help from the physiotherapist to maintain or improve muscle strength and physical function. These findings highlight the need for physiotherapists to co-develop (with the patient) a multi-faceted management plan that does not only focus on pain relief strategies but also incorporates interventions that target strength and assist

patients to engage in activities that are meaningful to them. It is thus not surprising that participants in our study described the important role that physiotherapists played in prescribing personalised exercise and addressing functional deficits. A systematic review of patients' perceived health service needs for OA also showed that one of the key reasons patients typically consulted physiotherapists was for exercise advice/prescription.<sup>5</sup> Our patient perspectives about the important role that physiotherapists play in prescribing exercise align with the perspectives of general practitioners,<sup>30, 31</sup> who often refer patients with chronic knee pain to physiotherapists for exercise. General practitioners describe lack of time as the most common barrier for them to initiate exercise with their patients, preferring instead to refer their patient to a physiotherapist.<sup>30, 32</sup> Similarly, physiotherapists themselves also perceived exercise and physical activity to be their main role in the management of people with knee OA<sup>7</sup> and are confident to prescribe exercises to improve knee strength and range of movement.<sup>8</sup> However, inconsistent with the Clinical Care Standard, it appeared that patients were predominantly assessed by their physiotherapist for their knee symptoms and functional limitations, with little consideration of psychosocial factors. In addition, the management plan provided by the physiotherapist tended to overlook strategies specifically related to weight loss/maintenance. Our patient findings are also similar to our previous study with physiotherapists,<sup>7</sup> who tended to focus on biomedical assessment and management of knee OA. Regarding weight loss advice, they generally provided education about the importance of weight loss rather than advice about strategies to lose weight.

Interestingly, participants tended to have an OA diagnosis already made prior to their physiotherapy consultation. They also believed that they already had adequate knowledge and understanding about their knee OA. This was despite the fact that participants appeared to have different perceptions about knee OA (describing it as 'wear and tear', 'bone on bone', 'degenerative' and/or 'cartilage wear') and their belief that surgery is an inevitable consequence. These perceptions and beliefs about OA are similar to findings from another study exploring reasons why patients resorted to surgical interventions for knee OA.<sup>33</sup> Once the participants in that study had been "diagnosed" with "bone-on-bone" changes, many disregarded exercise-based interventions (which they believed would damage their joint) in favour of alternative

and experimental treatments (which they believed would help regenerate lost cartilage). Such perceptions and beliefs about OA are detrimental considering there is often a mismatch between imaging findings and OA symptoms<sup>46, 47</sup> and that conservative management such as exercise can reduce pain irrespective of radiographic severity.<sup>48, 49</sup> In addition, as some primary care specialists are hesitant to refer patients with OA to physiotherapy because they either perceive exercise to be ineffective or lack trust in physiotherapists to provide evidence-based care,<sup>50</sup> patients may not necessarily have been well-informed about the benefits of exercises during their specialist consultation.<sup>51</sup> In order to maximise success with exercise interventions, these findings suggest that physiotherapists could consider reframing their conversations to actively invite the patient to share their pre-existing knowledge about OA so that any perceptions may be subtly corrected, and evidence-based educational resources shared. Physiotherapists should consider the language they use when discussing OA (i.e., avoid biomedical terms such as ‘wear and tear’ or ‘degenerative’) so that they are not contributing to patient misinformation (i.e., joint surgery is inevitable; OA symptoms will worsen over time), and instead provide a sense of hope and optimism for prognosis with conservative care.

Participants also did not expect physiotherapists to provide them with information regarding medications, knee injections and surgery even though these topics are advocated as important responsibilities of all health professionals when managing OA.<sup>1, 34</sup> Instead, participants generally approached their medical doctors for advice in these domains of care. This is likely because, in Australia, physiotherapists can only provide advice about over-the-counter medications and do not have prescribing rights. Regarding knee surgery, patients mainly sought physiotherapy care to postpone or prepare for knee surgery. Our patient findings are similar to our previous study with physiotherapists,<sup>7</sup> who had also felt that surgical advice was outside the scope of practice of physiotherapy care. However, some physiotherapists described their role as preparing patients for knee surgery when they were referred for physiotherapy.

Some participants received adjunctive treatments from their physiotherapist, such as massage, acupuncture, and electrotherapy interventions despite limited evidence to support their use.<sup>1, 3, 36</sup> We do not know if participants specifically requested these treatments and/or if their physiotherapist helped the participant to make an informed

treatment decision by discussing their limited treatment efficacy for knee OA. Patients with other musculoskeletal conditions, such as low back pain, often present to physiotherapists with pre-conceived ideas about physiotherapy treatment,<sup>37</sup> and may desire ‘hands-on’ treatment or any intervention that has previously eased their back symptoms. Physiotherapists may feel obliged to provide treatments with limited efficacy in order to meet the patient’s treatment expectation.

A strength of our study was its qualitative design, which allowed us to explore the experiences of people receiving physiotherapy care for knee OA in Australia. In order to explore diversity in experiences, we interviewed a range of participants, including males and females of differing age, occupational status and geographical location across Australia. Our study also has limitations. There was no patient and public involvement in the design of this research. Participants responded to advertisements (social media) and/or email invitations (research volunteer database) to participate and thus our sample may be biased towards those who had favourable experiences with physiotherapy and/or were successful at accessing physiotherapy. There were many more females than males in the sample which may reflect the social media approach to recruitment. Participants were reimbursed for their time with a \$50 gift card so they might have responded to interview questions in a socially desirable manner. Efforts were made to reduce this effect by informing participants at the beginning of the interview that there were no right or wrong answers to the questions asked. Our sample was constrained to participants who could speak English and given that 21% of Australians speak a language other than English at home,<sup>38</sup> we do not know if our findings reflect the experiences of people from culturally and linguistically diverse backgrounds. Furthermore, physiotherapists are a primary contact health profession in Australia so patient experiences with physiotherapy care for knee OA may be different in other countries where people can only access a physiotherapist on referral. Future research is particularly warranted in low to middle income countries, given that social factors such as education level and income influence patient access to allied health services such as physiotherapy.<sup>39</sup> Our findings may also not be applicable in countries where cultural beliefs differ considerably from the Australian context. The perception of pain, health beliefs and concept of disability and its management often vary from

one culture to another<sup>40</sup> and thus may influence patients' experiences managing their conditions.

In conclusion, our findings provide evidence from the patient's perspective about the important role physiotherapists play in the care of Australians with knee OA, reinforcing the need for equitable access to physiotherapy services that are supported by a range of funding models. Findings highlight the importance of different pathways for accessing care to meet the needs of individuals and ensure that all people with knee OA are adequately supported in managing their condition. Overall, patients' experiences with receiving physiotherapy care for their knee OA were partly aligned with the Clinical Care Standard, particularly regarding comprehensive assessment, self-management, and exercise.

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## **Chapter Seven Discussions and Implications**

The overall objective of this thesis was to build on the current understanding of the quality of care provided by physiotherapists to people with hip and/or knee OA, by developing QIs to evaluate such care and by exploring the experiences of physiotherapists and patients delivering and receiving care for knee OA in Australia. This chapter summarises the main findings of this thesis, implications of the findings, strengths and limitations of the studies, and directions for future research.

### **7.1 Summary of main findings**

Study One (Chapter Three) identified and prioritised the most important clinical guideline recommendations for physiotherapists to implement when managing people with hip and/or knee OA. The final list contained 30 recommendations and they were sub-grouped into six content areas, namely diagnosis and assessment, physiotherapy core treatments, adjunctive physiotherapy treatments, review and referral, principles of treatment planning/delivery and communication essentials. The top recommendations related to providing exercise, weight management, and education as core treatments; individualised OA management; and communication approaches.

Study Two (Chapter Four) developed a patient-reported QI tool for physiotherapy management of hip and knee OA based on the final list of 30 recommendations from Study One and assessed the clinimetric properties of the tool. The final QUIPA tool contained 18 items categorised into three subscales, which were assessment and management planning, core recommended treatments, and adjunctive treatments. The QUIPA tool showed acceptable test-retest reliability for subscales and total score but individual items showed inadequate reliability. All predefined hypotheses to assess construct validity were confirmed. However, agreement between physiotherapists and participants for single items and total score showed large measurement error, resulting in inadequate criterion validity. Therefore, the QUIPA tool needs to be refined to improve its clinimetric properties before it can be usefully implemented.

Study Three (Chapter Five) explored the experiences of Australian physiotherapists delivering care for people with knee OA and investigated the degree to which their

reported experiences aligned with the national OA of the Knee Clinical Care Standard. This study found physiotherapists relied on biomedical assessment with minimal psychosocial evaluation. The primary goal for physiotherapists was to provide goal-orientated personalised exercise, typically within an episode of short-term care. Surgery was perceived as a last resort, but physiotherapists prepared patients who decided on surgery. Patient comorbidity, patient adherence and patient desire for a ‘quick fix’ were the main clinical challenges experienced. There was a mismatch between what physiotherapists know and what they do when it came to imaging, weight management and manual therapy. Weight loss, medication and surgical advice were perceived to be outside of physiotherapy scope of practice. Nevertheless, physiotherapists’ reported experiences were mostly consistent with the quality care standard.

Finally, Study Four (Chapter Six) explored the experiences of Australian patients receiving care for knee OA. This study found that patients often arrived at physiotherapists with a pre-existing OA diagnosis and were comfortable with their knowledge about OA. They also perceived surgery to be inevitable for knee OA. Patients commonly saw physiotherapists for knee pain and functional issues and accessed the service via various referral pathways, funding models and delivery models. Physiotherapy treatments were perceived to be mainly exercise based with some adjunctive treatments provided. In addition, patients did not think advice about surgery, medications, and injections was the role of physiotherapists. Overall, patients were generally happy and satisfied with their physiotherapy experiences. Findings show that physiotherapists play an important role in providing care to people with knee OA, so strategies to ensure physiotherapy service is accessible are necessary.

## **7.2 Implications of findings**

Findings from this thesis lay the groundwork for future development and testing of QIs to evaluate quality of physiotherapy care for people with hip and/or knee OA. Findings also contribute to a deeper understanding of the quality of physiotherapy care for people with knee OA both from the physiotherapists’ and patients’ perspectives. Such information is important to identify and understand gaps in clinical practice and help inform strategies to improve future practice. In addition, findings can also help guide training of physiotherapy students and graduates in OA management. These findings

have several implications for the development and testing of patient-reported QIs for physiotherapy management of hip and/or knee OA and evaluation of the overall quality of physiotherapy care, specifically for people with knee OA.

### ***7.2.1 Development and testing of quality indicators for physiotherapy care of hip and knee osteoarthritis***

The development of the QUIPA tool (Chapter Four) involved extracting clinical guidelines recommendations most relevant to physiotherapy practice identified from the consensus exercise (Chapter Three), adapting phrasings from the validated UK-QI tool (Blackburn et al., 2016) for recommendations that overlapped, and refining the language and format of the QUIPA tool via focus groups. Despite a rigorous process to develop the QUIPA tool, the tool showed inadequate test-retest reliability for individual items and large measurement error for agreement between physiotherapists and patients. It also appears that some items remain ambiguous and may be interpreted differently from the perspective of a patient or a physiotherapist. In addition, if care is not delivered effectively or is perceived by patients as not important, discrepancy can occur between patients and physiotherapists when responding to the tool.

These findings question the reliability and validity of this patient-reported QI tool to accurately assess clinical performance of clinicians, in this case, physiotherapists in providing care for hip and/or knee OA. Although previous studies have supported the use of patient-reported QIs for assessing OA care (Osteras et al., 2013; Osteras et al., 2018), none evaluated agreement between patients and their designated healthcare providers on individual QI. This is important to ensure that the care reported by patients was in fact, a reflection of the care received. In addition, considering the QUIPA items are based on clinical guideline recommendations, they need to be revised and re-tested when the clinical guidelines are updated.

### ***7.2.2 Quality of physiotherapy care for knee osteoarthritis***

Findings (Chapters Five and Six) indicated that physiotherapy management of knee OA in Australia was mostly consistent with the national quality care standard. Patients were generally happy and satisfied with the physiotherapy care received (Chapter Six). Consistent with findings from previous studies (da Costa, Vieira, et al., 2017; Holden et al., 2008; Holden et al., 2009; MacKay et al., 2020; Nicolson et al., 2018; Spitaels et

al., 2017; Walsh et al., 2009), exercise was the central treatment used by physiotherapists when managing people with knee OA (Chapter Five and Six). Findings highlight the important role physiotherapists play in exercise prescription for people with OA. However, there are some areas of physiotherapy care that warrant further consideration.

First, when it comes to exercising, physiotherapists perceived patient comorbidity and adherence to exercise to be their main challenges as health professionals caring for people with OA (Chapter Six). Comorbidity is common in patients with knee OA and is often associated with more pain, reduced function and further limitations to daily activity (Muckelt et al., 2020). The presence of comorbidity may restrict patients from exercising, thus, physiotherapists need to be flexible in their approach to exercise prescription to ensure that a program is adequately tailored to any comorbidities (Dekker et al., 2016). When it comes to patient adherence to exercise, evidence suggests that compliance rates to home exercise programs can often vary among patients (Nicolson, Hinman, Kasza, et al., 2018). As clinical benefits of exercise decline over time due to poor compliance (Mazieres et al., 2008; Pisters et al., 2010), it is important that physiotherapists are skilled in patient motivational and behavioural change techniques to improve exercise adherence. However, research has shown that physiotherapists lacked knowledge and confidence to use such techniques in practice hence, further training is required (Driver et al., 2017).

Second, physiotherapy care may benefit from increased attention to psychosocial factors when managing people with knee OA so that social and psychological factors which may be impacting joint symptoms, quality of life and ability to engage in daily activities, family and social duties may be effectively addressed. A biopsychosocial approach to OA management ensures that patients' global needs are considered and tailored treatment options are provided to facilitate patients to effectively self-manage their conditions (NICE, 2014). Such management helps to improve patient satisfaction with care and minimise the likelihood of poorer health outcomes resulting from psychosocial factors (Driver et al., 2017; Gluyas, 2015). In addition, physiotherapists should pay increased attention to the language they use when discussing OA (i.e. avoid biomedical terms such as 'wear and tear' or 'degenerative') so that they are not

contributing to patient misinformation (i.e. joint surgery is inevitable; OA is a ‘degenerative’ condition; imaging is required to diagnose OA), and instead provide a sense of hope and optimism for prognosis with conservative care.

Physiotherapy care may be enhanced by a more proactive emphasis on provision of advice and/or referral for weight loss. Although physiotherapists perceived weight loss advice to be outside of physiotherapy scope of practice (Chapter Five) and patients supported that notion (Chapter Six), access to dietitians in Australia remains a problem with 2014 health workforce data showing that there were only 6200 accredited practising dietitians (Health Workforce Australia) compared to 27011 registered physiotherapists in Australia (Australian Government Department of Health, 2017). Therefore, it is unrealistic to expect all patients with OA to be referred to dietitians and physiotherapists may have the capacity to better support patients with weight management. However, it was evident from Study Three that physiotherapists were unsure of the most effective strategies for weight loss when managing patients with knee OA who are overweight or have obesity. Indeed, evidence shows that physiotherapists lack confidence, knowledge, and skills to effectively devise weight loss management plan with their patients (Allison et al., 2019; MacKay et al., 2020). Given weight loss is a core treatment for OA management, additional training may be necessary to equip physiotherapists with knowledge and skills to better advise and support their patients with knee OA to lose weight.

In addition, physiotherapy care may also be further improved by a more proactive approach to providing advice on pain medications and knee surgery. These domains of care are important components of a comprehensive management of OA and should not be overlooked. By providing information about the potential benefits and harms of common OA medications and surgical interventions, physiotherapists will be able to fully inform their patients about their treatment options and potentially increase engagement with conservative strategies, such as exercise. Such skills have been identified as key capabilities required of all clinicians managing people with OA to deliver best practice for OA care (Hinman et al., 2020).

Finally, findings from studies Three and Four show that physiotherapists typically offer short-term episodic care to patients with knee OA. This is partly because patients often

rely on funding to subsidise the cost of physiotherapy care. Regular and ongoing review for people with OA is important to provide support and monitoring of their OA and progress with treatment (Australian Commission on Safety and Quality in Health Care, 2017; Fernandes et al., 2013; NICE, 2014). Thus, the findings highlight the importance of appropriate funding mechanisms to support people accessing physiotherapy care for their knee OA both in private and public sectors. The findings support the calls for an expansion of Government-funded allied health services (Victorian Musculoskeletal Clinical Leadership Group, 2018), such as the Chronic Disease Management initiative (funded through the Medicare scheme) to allow for more visits with physiotherapists than the five per year that are currently funded.

### **7.3 Strengths of the research**

Strengths of each study within this thesis have been highlighted within their respective chapters. This section will provide an overview of the main strengths of the research.

A major strength is the range of methodologies used across the four studies in this thesis. These included a modified-Delphi technique, priority ranking exercise and focus groups to develop the QUIPA tool to evaluate physiotherapy care for hip and/or knee OA. Reliability and validity testing were subsequently conducted to assess the clinimetric properties of the tool. In addition, a qualitative research design was used to explore in-depth the quality of physiotherapy care for people with knee OA. Both physiotherapists and patients were included in the qualitative studies so that gaps in physiotherapy management of knee OA could be identified and understood from both perspectives. Findings from the qualitative studies can also be used to explain why it was difficult to ascertain certain information from patients using the QUIPA tool and help refine the QIs for future use. For instance, in Study Four, patients were interviewed about the type of questions asked by their physiotherapist during their consultation session. Many were unsure if questions that were asked were part of physiotherapy assessment or social conversation. This could help explain why some participants might struggle to answer QIs relating to assessment and management planning in the QUIPA tool (Study Two). Furthermore, as evident from Study Four, patients generally perceived their pre-existing knowledge and understanding about OA to be adequate, so patients might not accurately recall the type of OA information provided by

physiotherapists when responding to QIs relating to discussion around what OA is and how pain is caused by OA in Study Two.

Another strength of this thesis is the conceptual design where study findings and limitations influenced and linked to subsequent studies. Study One identified and prioritised 30 clinical guideline recommendations most relevant for physiotherapy management of hip and/or knee OA and these were used to develop the QUIPA tool in Study Two. Although the tool was later found to require further refinement to improve its clinimetric properties before implementation (Study Two), findings also highlighted the need to explore experiences with physiotherapy care for OA using different research designs. Subsequently, Study Three and Four were designed to qualitatively explore physiotherapy care for knee OA from the perspectives of the physiotherapists and patients to gain a richer and deeper understanding than can be gained from a QI tool.

Another strength is the generalisability of the research findings. The consensus exercise (Chapter Three) included participating physiotherapists from fourteen countries and with different scopes of practice, cultures, training, and health care contexts whilst the two qualitative studies (Chapter Five and Six) included physiotherapists and patients of different ages and work status who practised/lived in rural, regional, and metropolitan areas across all states of Australia. Therefore, results of the first two studies are generalisable to physiotherapists working in high- and middle-income countries and those of the last two studies provide information from a wide range of physiotherapists and people with OA within Australia.

### **7.3 Limitations of the research**

The limitations of each study have been outlined within their respective chapters. This section outlines the main limitations of the research. Recommendations from the first study were extracted from two clinical guidelines so we might have missed important recommendations included in other guidelines. Furthermore, generic OA clinical guidelines were selected for this study because there were no current physiotherapy-specific hip and knee OA guidelines at the time of study planning. Since then, the 2009 clinical guideline for hip OA developed by the Orthopaedic Section of the American Physical Therapy Association (Cibulka et al., 2017) and the 2010 Dutch clinical guideline for physiotherapy in patients with hip or knee OA (van Doormaal et al., 2020)

have been updated. As the QUIPA tool (Chapter Four) was developed based on clinical guideline recommendations (Chapter Three), it needs to be periodically revised and refined, guided by the most updated recommendations for physiotherapy management of hip and/or knee OA.

Although the QUIPA tool can be used to measure specific elements of practice either from a patient's or physiotherapist's perspective, one of its limitation as discussed in Chapter Two is that it does not capture the personal experiences of individuals. Therefore, it is difficult to understand the rationale behind every response to the QI items. Such information is important for understanding the causes of the gaps that are impacting quality of physiotherapy care for people with OA. Considerations for future assessment of quality of physiotherapy care for people with OA may include using a mixed-methods approach to assessing care, such as combining the use of a QI tool with a qualitative approach, may that be via interviews or open-ended survey questions.

In second study (Chapter Four), Cohen's Kappa (95% CI) was one of the measures used to evaluate test-retest reliability and criterion validity of the QUIPA tool. Despite attempts to increase variability in the data (i.e., providing physiotherapists with different cue cards that contained specific tasks/treatments they were requested to do, or not do), most of the patients and treating physiotherapists chose 'yes' as their response options to the QIs resulting in a high prevalence of 'yes' responses to some of the QI items. Considering that the Kappa estimate is highly dependent on the prevalence of a specific answer for the QI items (Feinstein et al., 1990), it is important when reporting Kappa values to also include associated percentage of agreement, the prevalence and CI to ensure proper interpretation of results (Chen et al., 2009). Prevalence-adjusted bias-adjusted Kappa (PABAK) may be another useful statistic to consider in the future (Chen et al., 2009).

Criterion validity for the QUIPA tool was determined by assessing agreement between physiotherapists and patients at one week post consultation. The one-week recall period for patients could result in a low level of agreement with physiotherapists. One way to address this is to possibly have a shorter recall period, ideally by requiring patients to complete the QUIPA tool immediately after their consultation session.

The last two studies of this thesis were conducted within Australia, so the experiences of participants may not apply to physiotherapists and people with knee OA globally, particularly in countries where physiotherapists are not primary care practitioners and people can only access a physiotherapist on referral. Moreover, most participants from both studies were recruited using online advertisement methods (e.g. Facebook) so our data may be biased towards those who use a Facebook account. The samples for both studies were constrained to people who could speak English, so our findings may not reflect the experiences of people from culturally and linguistically diverse backgrounds. Qualitative methods used in the last two studies also do not provide statistical data so the responses received cannot be quantified and measured for further quality evaluation of physiotherapy care for OA management.

#### **7.4 Directions for future research**

This thesis provides findings that need to be considered when developing and testing QIs to assess OA care. It also adds to the current understanding of the quality of physiotherapy care for people with knee OA. Findings from this thesis highlight several directions for future research. The first study detailed 30 most important recommendations for physiotherapy management of people with hip and/or knee OA. Future research could use these findings as a basis to develop a model OA consultation (Porcheret et al., 2013) or a training program for physiotherapists in assessing and treating people with hip and/or knee OA in order to guide, evaluate and enhance physiotherapy practice.

Further refinement and re-evaluation are required to improve the clinimetric properties of the QUIPA tool. First, the QUIPA items need to be updated to reflect the most current recommendations for physiotherapy management of hip and/or knee OA. Considering the QUIPA items were derived from the clinical guidelines, they need to be revised when the guidelines are updated. Second, a shorter patient recall period (ideally getting patients to complete the QUIPA tool immediately after their physiotherapy consultation) is required to improve the measurement quality of the tool. Next, ambiguous items need to be further refined and clarified so that they are not interpreted differently by patients or physiotherapists. Cognitive interviewing involving verbal probing and think-aloud methods (Eccles et al., 2017) could be conducted with patients

or physiotherapists (either via focus groups or individual interviews) whilst they are completing the QUIPA tool to ensure that the wording of each QI item is optimised and that each item appropriately captures its respective domain (Hill et al., 2016). In addition, this process can facilitate the development of more specific instructions for patients or physiotherapists when responding to the QUIPA tool. Finally, the response options for the QI items may need to be reduced wherever possible. For instance, the response options of ‘Don’t remember’ and ‘No such problems’ may be combined for some QI items considering both options do not contribute to the total score. Future research on the patient-reported QI tool should also evaluate agreement between patients and their designated healthcare providers on each individual QI to determine the validity of the tool.

Findings from studies Three and Four help to explain discrepancy between current physiotherapy practice and quality standard for knee OA management in Australia. Therefore, further research should focus on developing and evaluating strategies to better support physiotherapists to provide OA care that aligns with the best practice recommendations. While it is currently unclear what practice training method is the most effective in encouraging physiotherapists to use the best evidence available, preliminary work has found that guided small group work with interactive education can be effective (Tilson et al., 2016; Tilson et al., 2014). In addition, evidence also suggests that interactive and multifaceted education programs that include training with audit and feedback, and clinical decision support systems can be useful to enhance clinicians’ knowledge and facilitate guideline implementation into practice (Chauhan et al., 2017). Organizational changes to support multidisciplinary collaboration within the primary care team have also been found to improve clinicians’ adherence to guidelines (Unverzagt et al., 2014). Therefore, future studies (ideally based on a randomized controlled design) are required to identify the most effective strategies that can encourage physiotherapists to adopt the best evidence available (such as clinical guidelines) when managing OA. It would also be important then to evaluate the influence of these strategies on patients’ outcomes.

## 7.5 Conclusion

All four studies in this thesis build on the current understanding of the quality of care provided by physiotherapists to people with hip and/or knee OA. The first two studies lay the groundwork for future design and testing of patient-reported QI tool for benchmarking quality of physiotherapy care in hip and/or knee OA. More research is required to refine the QUIPA tool to improve its clinimetric properties before its implementation in clinical practice. Overall, findings from qualitative studies indicated that physiotherapy management of knee OA in Australia mostly aligned with the national quality care standard and patients were generally happy and satisfied with the physiotherapy care received. Suggested areas to improve care delivered by physiotherapists include increased psychosocial consideration in assessment and treatment, attention to the language used when discussing OA (i.e. avoid biomedical terms such as ‘wear and tear’ or ‘degenerative’) so that physiotherapists are not contributing to patient misinformation (i.e. joint surgery is inevitable; OA is a ‘degenerative’ or ‘wear and tear’ condition; imaging is required to diagnose OA), providing advice on losing weight, pain medications and knee surgery, and offering regular longer-term reviews. Findings also highlight the importance of appropriate funding mechanisms to support people accessing physiotherapy care for their knee OA both in private and public sectors.

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## Appendix A

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*Journal of Orthopaedic & Sports Physical Therapy*  
1111 N. Fairfax St., Suite 201  
Alexandria, VA 22314  
Phone: [571-970-1062](tel:571-970-1062)  
[coreyparker@jospt.org](mailto:coreyparker@jospt.org) <<mailto:coreyparker@jospt.org>>

## Appendix B

### *Supplementary material – Chapter Three*

**Appendix 1:** Original recommendations extracted from the NICE Osteoarthritis: care and management in adults guidelines<sup>39</sup> and the EULAR recommendations for the non-pharmacological core management of hip and knee OA<sup>17</sup> after conversion into instructional recommendations.

R = recommendation

R1. Diagnose OA clinically without investigations (when a person is 45 or over, has activity-related joint pain and has either no morning joint-related stiffness or morning stiffness that lasts no longer than 30 minutes).

R2. Be aware that atypical features, such as a history of trauma, prolonged morning joint-related stiffness, rapid worsening of symptoms or the presence of a hot swollen joint, may indicate alternative or additional diagnoses.

R3. Assess the effect of OA on the person's function, quality of life, occupation, mood, relationships and leisure activities.

R4. Agree a plan with the person (and their family members or carers as appropriate) for managing their OA.

R5. Take into account comorbidities that compound the effect of OA when formulating the management plan.

R6. Discuss the risks and benefits of treatment options with the person, taking into account comorbidities. Ensure that information provided can be understood.

R7. Offer advice on the following core treatments to all people with clinical OA: access to appropriate information, activity and exercise, and interventions to achieve weight loss if the person is overweight or obese.

R8. Offer accurate verbal and written information to all people with OA to enhance understanding of the condition and its management, and to counter misconceptions, such as that it inevitably progresses and cannot be treated. Ensure that information sharing is an ongoing, integral part of the management plan rather than a single event at time of presentation.

R9. Agree individualised self-management strategies with the person with OA. Ensure that positive behavioural changes, such as exercise, weight loss, use of suitable footwear and pacing are appropriately targeted.

R10. Ensure that self-management programmes for people with OA, either individually or in groups, emphasise the recommended core treatments, especially exercise.

R11. Consider the use of local heat or cold as an adjunct to core treatments.

R12. Advise people with OA to exercise as a core treatment irrespective of age, comorbidity, pain severity or disability. Exercise should include local muscle strengthening and general aerobic fitness.

R13. Consider manipulation and stretching as an adjunct to core treatments, particularly for OA of the hip.

R14. Offer interventions to achieve weight loss as a core treatment for people who are obese or overweight.

R15. Consider the use of transcutaneous electrical nerve stimulation (TENS) as an adjunct to core treatments for pain relief.

R16. Do not offer glucosamine or chondroitin products for the management of OA.

R17. Do not offer acupuncture for the management of OA.

R18. Offer advice on appropriate footwear (including shock-absorbing properties) as part of core treatments for people with lower limb OA.

R19. Consider assessing people with OA who have biomechanical joint pain or instability for bracing/insoles as an adjunct to their core treatments.

R20. Consider assistive devices (for example, walking sticks) as adjunct to core treatments for people with OA who have specific problems with activities of daily living. Refer people with OA who have specific problems with activities of daily living appropriately (eg. occupational therapists).

R21. Do not refer for arthroscopic lavage and debridement as part of treatment for OA, unless the person has knee OA with a clear history of mechanical locking (as opposed to morning joint stiffness, 'giving way' or X-ray evidence of loose bodies).

R22. Offer paracetamol for pain relief in addition to core treatments; regular dosing may be required. Consider paracetamol ahead of oral NSAIDs, cyclo-oxygenase 2 (COX-2) inhibitors or opioids.

R23. Consider the addition of opioid analgesics if paracetamol or topical NSAIDs are insufficient for pain relief for people with OA. Consider the risk and benefits, particularly in older people.

R24. Consider topical NSAIDs for pain relief in addition to core treatments for people with knee OA. Consider topical NSAIDs ahead of oral NSAIDs, COX-2 inhibitors or opioids.

R25. Consider topical capsaicin as an adjunct to core treatments for knee OA.

R26. Do not offer rubefacients for treating OA.

R27. Consider substitution with an oral NSAID/COX-2 inhibitor if paracetamol or topical NSAIDs are ineffective for pain relief for people with OA.

R28. Consider the addition of an oral NSAID/COX-2 inhibitor to paracetamol if paracetamol or topical NSAIDs provide insufficient pain relief for people with OA.

R29. Use oral NSAIDs/COX-2 inhibitors at the lowest effective dose for the shortest possible period of time.

R30. When offering treatment with an oral NSAID/COX-2 inhibitor, the first choice should be either a standard NSAID or a COX-2 inhibitor (other than etoricoxib 60mg). In either case, co-prescribe with a proton pump inhibitor (PPI), choosing the one with the lowest acquisition cost.

R31. Consider individual patient risk factors, including age when prescribing oral NSAIDs/COX-2 inhibitors because all oral NSAIDs/COX-2 inhibitors have analgesic effects of a similar magnitude but vary in their potential gastrointestinal, liver and cardio-renal toxicity. Consider appropriate assessment and/or ongoing monitoring of the patient risk factors when prescribing the person with oral NSAIDs/COX-2 inhibitors.

R32. If a person with OA needs to take low-dose aspirin, consider other analgesics before substituting or adding an NSAID or COX-2 inhibitor (with a PPI) if pain relief is ineffective or insufficient.

R33. Consider intra-articular corticosteroid injections as an adjunct to core treatments for the relief of moderate to severe pain in people with OA.

R34. Do not offer intra-articular hyaluronan injections for the management of OA.

R35. Ensure that the person with OA has been offered at least the core (non-surgical) treatment options before referring the person for consideration of joint surgery.

R36. Base decisions on referral thresholds on discussions between patient representatives, referring clinicians and surgeons, rather than using scoring tools for prioritisation.

R37. Consider referral for joint surgery for people with OA who experience joint symptoms (pain, stiffness and reduced function) that have a substantial impact on their quality of life and are refractory to non-surgical treatment.

R38. Refer for consideration of joint surgery before there is prolonged and established functional limitation and severe pain.

R39. Patient-specific factors (including age, sex, smoking, obesity and comorbidities) should not be barriers to referral for joint surgery.

R40. When discussing the possibility of joint surgery, check that the person has been offered at least the core treatments for OA, and give them information about the benefits and risks of surgery and the potential consequences of not having surgery, recovery and rehabilitation after surgery, how having a prosthesis might affect them and how care pathways are organised in their local area.

R41. Offer regular reviews to all people with symptomatic OA. Agree the timing of the reviews with the person.

R42. Consider an annual review for any person with one or more of the following: troublesome joint pain, more than one joint with symptoms, more than one comorbidity and/or taking regular medication for their OA.

R43. Conduct initial assessments using a biopsychosocial approach including physical status, activities of daily living, participation, mood, as well as health education needs, health beliefs and motivation to self-manage.

R44. Individualise the treatment of hip and/or knee OA according to the wishes and expectations of the individual, localisation of OA, risk factors (such as age, sex, comorbidity, obesity and adverse mechanical factors), presence of inflammation, severity of structural change, level of pain and restriction of daily activities, societal participation and quality of life.

R45. Offer an individualised management plan (a package of care) that includes the core non-pharmacological approaches, specifically:

- a) information and education regarding OA
- b) addressing maintenance and pacing of activity

- c) addressing a regular individualised exercise regimen
- d) addressing weight loss if overweight or obese
- e) reduction of adverse mechanical factors (e.g. appropriate footwear)
- f) consideration of walking aids and assistive technology

R46. Information and education for the person with hip and/or knee OA should:

- a) be individualised according to the person's illness perceptions and educational capability
- b) be included in every aspect of management
- c) specifically address the nature of OA (a repair process triggered by a range of insults), its causes (especially those pertaining to the individual), its consequences and prognosis
- d) be reinforced and developed at subsequent clinical encounters;
- e) be supported by written and/or other types of information (eg, DVD, website, group meeting) selected by the individual
- f) include partners or carers of the individual, if appropriate

R47. When lifestyle changes are recommended, offer people with hip and/or knee OA an individually tailored programme, including long-term and short-term goals, intervention or action plan, and regular evaluation and follow-up with possibilities for adjustment of the programme.

R48. Select the mode of delivery of exercise education (e.g. individual 1:1 sessions, group classes, etc) and use of pools or other facilities according both to the preference of the person with hip and/or knee OA and local availability.

R49. Teach a regular individualised (daily) exercise regimen that includes strengthening (sustained isometric) exercise for both legs, including the quadriceps and proximal hip girdle muscles (irrespective of site or number of large joints affected), aerobic activity and exercise as well as adjunctive range of movement/stretching exercise.

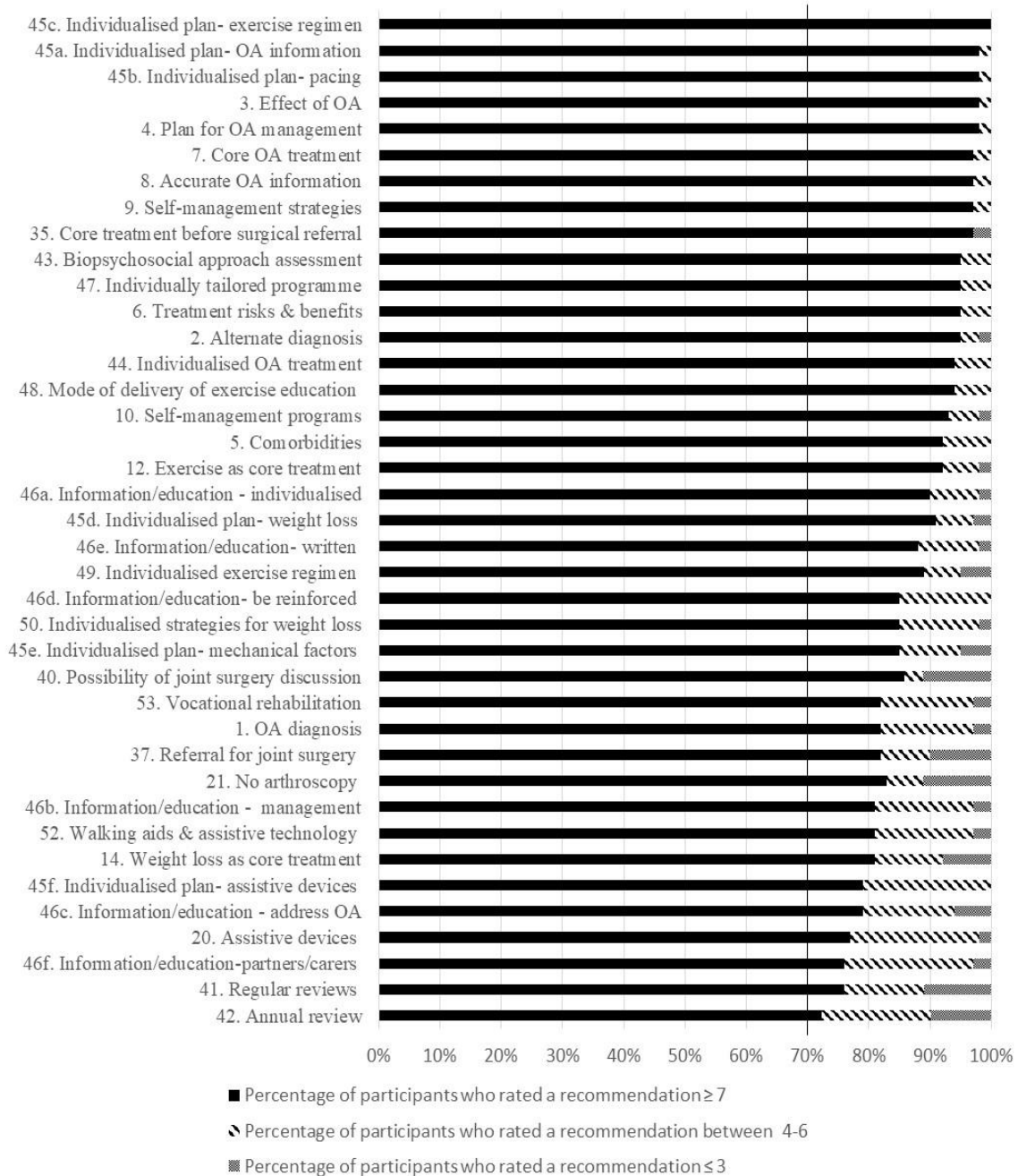
R50. When educating people with hip and/or knee OA on weight loss, incorporate individualised strategies that are recognised to effect successful weight loss and maintenance.

R51. Offer the person advice on appropriate and comfortable shoes.

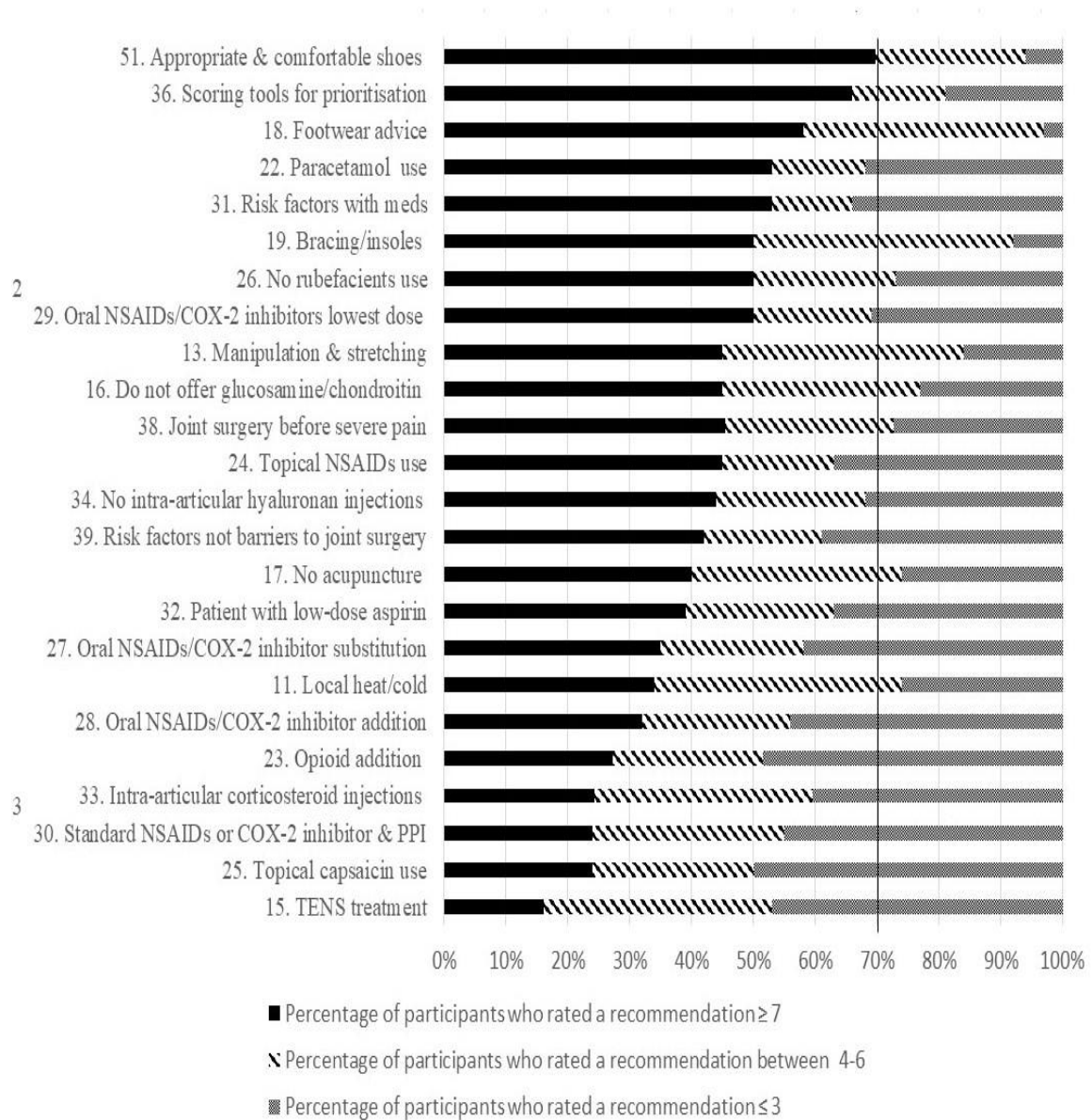
R52. Consider the use of walking aids, assistive technology and adaptations at home and/or at work to reduce pain and increase participation.

R53. For people who are at risk of work disability or who want to start/return to work, provide them with rapid access to vocational rehabilitation, including counselling about modifiable work-related factors such as altering work behaviour, changing work tasks or altering work hours, use of assistive technology, workplace modification, commuting to/from work and support from management, colleagues and family towards employment.

**Appendix 2: Round One - the percentage of participants rating a recommendation  $\leq 3$ , between 4-6 or  $\geq 7$  out of 10 on numeric rating scale (0=not important, 10=extremely important). Thirty-nine recommendations were included directly into Round Three as  $\geq 70\%$  of the respondents rated these recommendations  $\geq 7$ . The complete recommendation corresponding to each number can be found in Appendix 1.**



**Appendix 3: Round One - the percentage of participants rating a recommendation  $\leq 3$ , between 4-6 or  $\geq 7$  out of 10 on numeric rating scale (0=not important, 10=extremely important). Twenty-four recommendations were re-rated in Round Two as they did not reach consensus for inclusion ( $\geq 70\%$  of respondents rating  $\geq 7$ ). The complete recommendation corresponding to each number can be found in Appendix 1.**



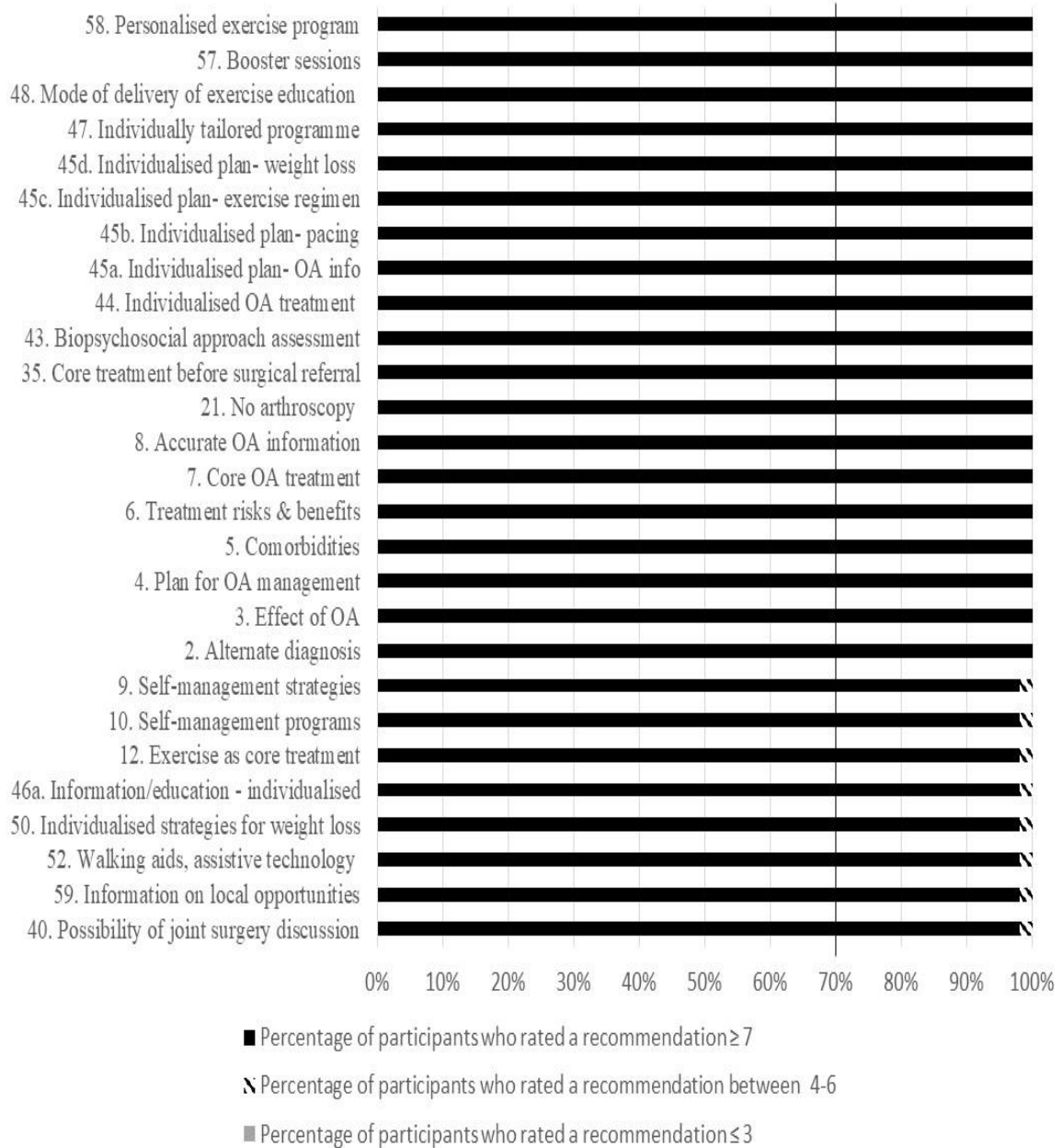
NSAIDs = non-steroidal anti-inflammatory drugs; COX-2 = cyclo-oxygenase-2; PPI = proton-pump inhibitor; TENS = transcutaneous electrical nerve stimulation.

**Appendix 4:** Seven new recommendations nominated by the panel in Round One and added to Round Two.

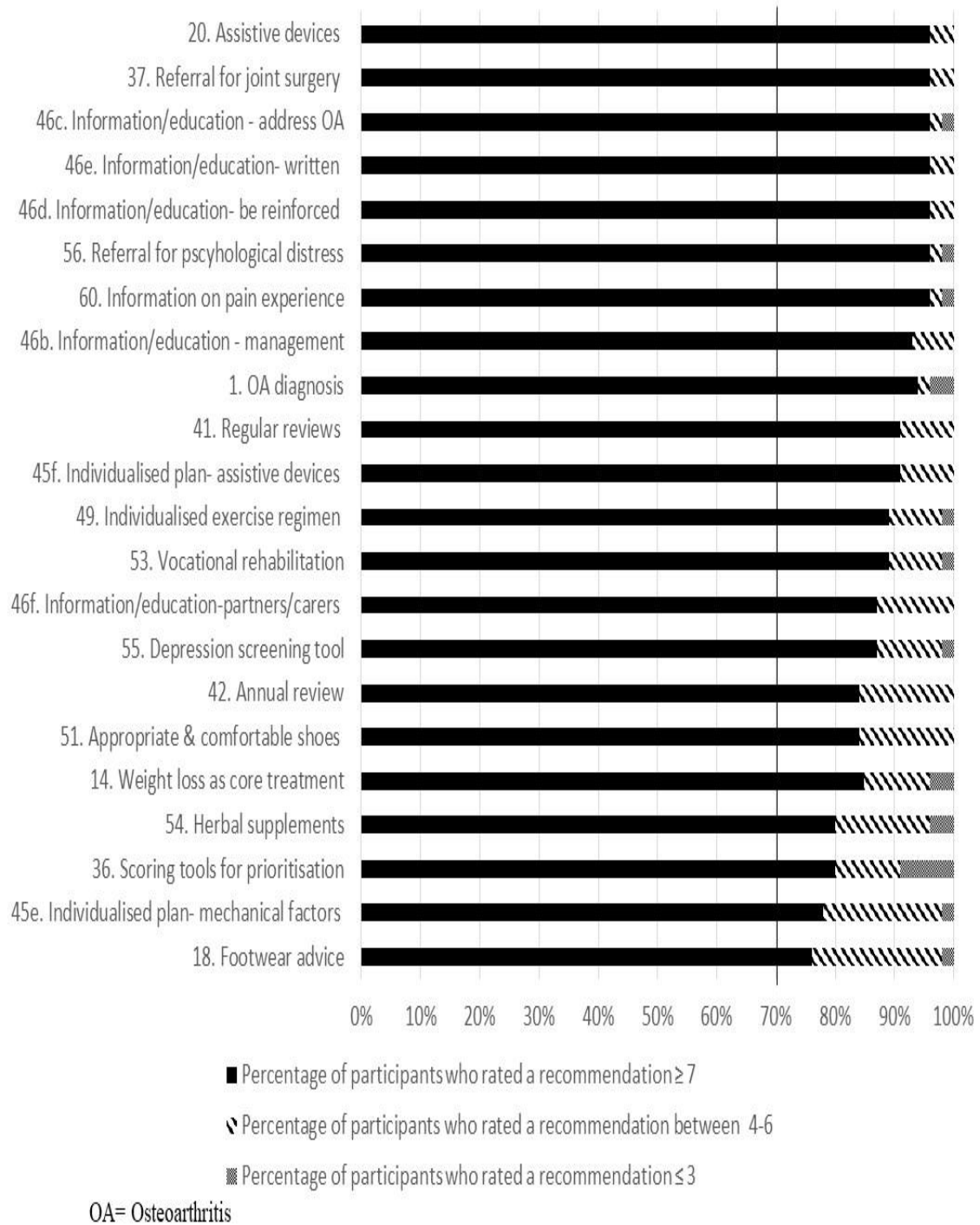
| New recommendations                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R54. Do not offer herbal supplements to people with hip and/or knee OA.                                                                                                                                                                                                                                                                                                                                                                        |
| R55. Screen for depression using an accepted depression screening tool.                                                                                                                                                                                                                                                                                                                                                                        |
| R56. Manage any psychological distress of the person (for example, referral to another health professional if required).                                                                                                                                                                                                                                                                                                                       |
| R57. Incorporate strategies to optimize adherence to treatment recommendations (for example, offer booster sessions to increase adherence to exercise).                                                                                                                                                                                                                                                                                        |
| R58. Discuss and offer a personalised exercise and physical activity program to people with hip and/or knee OA according to their needs, preferences, self-motivation and ability to perform the exercises. An appropriate exercise program may include muscle strengthening, aerobic activity, land or water based, supervised or unsupervised exercise program. The type and dosage of the exercise program should be individually tailored. |
| R59. Provide information on local opportunities for people to exercise locally at minimal financial cost.                                                                                                                                                                                                                                                                                                                                      |
| R60. Offer accurate verbal and written information to enhance understanding of the pain experience, including the neurobiological basis of pain.                                                                                                                                                                                                                                                                                               |

R = recommendation; OA = osteoarthritis.

**Appendix 5: Round Three - the percentage of participants rating a recommendation  $\leq 3$ , between 4-6 or  $\geq 7$  out of 10 on numeric rating scale (0=not important, 10=extremely important). Forty-nine recommendations were included in Stage 3 (priority-ranking exercise) as  $\geq 70\%$  of the respondents rated these recommendations  $\geq 7$ . The complete recommendation corresponding to each number can be found in Appendix 1.**



OA= Osteoarthritis



## Appendix C

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Pek Ling Teo [plteo@student.unimelb.edu.au](mailto:plteo@student.unimelb.edu.au)



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**Ruth Alcantara**

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## Appendix D

### *Supplementary material – Chapter Four*

**Additional file 1:** The development of the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool. The QUIPA tool was originally generated from the final list of ranked recommendations in a consensus study [28], compared with the United Kingdom-Quality Indicator (UK-QI) questionnaire [22] and later transformed into question format by utilizing some of the wordings from the UK-QI questionnaire (Stage 1) before being refined further in the focus groups (Stage 2).

| Extracted recommendations according to their rankings (Teo, Hinman, Egerton, Dziedzic, & Bennell, 2019) – Stage 1                                                                                                                                                                                               | Quality indicators from Blackburn et al. (2016) – Stage 1                                                                              | Quality indicators for focus groups - Stage 2                                                                                                                                                                                                                                                                                  | Final quality indicators for the QUIPA tool                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R1. Offer advice on the following core treatments to all people with clinical OA: access to appropriate information, activity and exercise, and interventions to achieve weight loss if the person is overweight or obese. <sup>a</sup>                                                                         | Have you been advised to lose weight?<br>Yes/No/Not overweight                                                                         | Q9a. If you are overweight, did the physiotherapist advise you to lose weight? Yes/No/Don't remember/Not overweight                                                                                                                                                                                                            | Item #13a. If you are overweight, did a physiotherapist discuss the benefits of losing weight? Yes/No/Don't remember/Not overweight                                                                                                                 |
| R2. Discuss and offer personalised exercise and physical activity program according to needs, preferences, self-motivation and ability to perform exercises. An appropriate program may include strengthening aerobic, land or water based, supervised or unsupervised. The type and dosage should be tailored. |                                                                                                                                        | Q8a. Did the physiotherapist teach or provide you with a specific exercise/physical activity program for your hip/knee OA? Yes/No/Don't remember                                                                                                                                                                               | Item #10. Did a physiotherapist offer you a specific exercise program for you to perform regularly for your OA? Yes/No/Don't remember/Already doing own exercise program (If the answer is 'no' for this question, Q18 is omitted and not answered) |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                        | Q8b. If you answered 'yes' to question 8a, did the physiotherapist consider your personal needs and preferences when designing your exercise/physical activity program? Yes/No/Don't remember                                                                                                                                  | Item #11. Did a physiotherapist consider your personal situation and preferences when discussing a specific exercise program? Yes/No/Don't remember                                                                                                 |
| R3. Advise people with OA to exercise as a core treatment irrespective of age, comorbidity, pain severity or disability. Exercise should include local muscle strengthening and general aerobic fitness.                                                                                                        | Have you been given information or advice about physical activity and exercise to help you with your joint pain? Yes/No/Don't remember | Q6. Did the physiotherapist give you information/advice about muscle strengthening exercises to help you with your hip/knee OA? Yes/No/Don't remember<br><br>Q7. Did the physiotherapist give you information/advice about general aerobic exercise (such as walking) to help you with your hip/knee OA? Yes/No/Don't remember | Q6 was captured in item #10.<br><br>Q7 was captured in item #10.                                                                                                                                                                                    |

| Extracted recommendations according to their rankings (Teo, Himman, Egerton, Dziecizic, & Bennell, 2019) – Stage 1                                                                                                                                                                                                           | Quality indicators from Blackburn et al. (2016) – Stage 1                                                                                                                                        | Quality indicators for focus groups - Stage 2                                                                                                                                                                                                | Final quality indicators for the QUIPA tool                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R4. Agree a plan with the person (and family members/carers) for managing OA, individualised according to the wishes and expectations of the individual, localisation of OA, risk factors, presence of inflammation, structural change, pain, activity restriction, societal participation and quality of life. <sup>a</sup> |                                                                                                                                                                                                  | Q16. Did you discuss and agree with the physiotherapist on a plan for managing your hip/knee OA? Yes/No/Don't remember                                                                                                                       | Item #5. Did you discuss and agree with a physiotherapist on your management plan for your OA? Yes/No/Don't remember                                                                  |
| R5. Offer accurate verbal and written information to enhance understanding of OA and its management, pain experience and to counter misconceptions. Ensure that information sharing is an ongoing, integral part of the management plan rather than a single event at time of presentation. <sup>a</sup>                     | Have you been given information about joint pain from a health professional? Yes/No/Don't remember                                                                                               | Q3. Did the physiotherapist give you information/advice to improve your understanding about hip/knee OA and pain? Yes/No/Don't remember                                                                                                      | Item #7. Did a physiotherapist discuss what OA is? Yes/No/Don't remember                                                                                                              |
|                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                  |                                                                                                                                                                                                                                              | Item #8. Did a physiotherapist discuss how pain may be caused by OA? Yes/No/Don't remember                                                                                            |
| R7. Assess the effect of OA on the person's function, quality of life, occupation, mood, relationships and leisure activities and assess health education needs, health beliefs and motivation to self-manage. <sup>a</sup>                                                                                                  | If you have had problems with daily activities, have these problems been assessed by a health professional? Yes/No/No such problems (this was changed to assess how OA affects a patient's life) | Q1. Did the physiotherapist assess how your hip/knee OA affects your life (such as your function, occupation, relationships and/or leisure activities) and your ability to participate in activities important to you? Yes/No/Don't remember | Item #1. Did the physiotherapist ask about how your hip/knee OA affects your life (such as your function, occupation, relationships and/or leisure activities)? Yes/No/Don't remember |
| R8. Agree individualised self-management strategies with the person with OA. Ensure that positive behavioural changes, such as exercise, weight loss, use of suitable footwear and pacing are appropriately targeted. <sup>a</sup>                                                                                           | Have you been given any advice on how you might help yourself to manage or deal with your joint pain? Yes/No/Don't remember                                                                      | Q5. Did the physiotherapist give you information/advice on how you might help yourself to manage or deal with your hip/knee OA? Yes/No/Don't remember                                                                                        | Q5 was discarded as it was vague and not measurable.                                                                                                                                  |

| Extracted recommendations according to their rankings (Teo, Hinman, Egerton, Dziedzic, & Bennell, 2019) – Stage 1                                                                                                                                             | Quality indicators from Blackburn et al. (2016) – Stage 1                                                                                                                                                                                              | Quality indicators for focus groups - Stage 2                                                                                                                                                                                                                | Final quality indicators for the QUIPA tool                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R10. When lifestyle changes are recommended, offer people an individually tailored programme, including long-term and short-term goals, intervention or action plan, and regular evaluation and follow-up with possibilities for adjustment of the programme. |                                                                                                                                                                                                                                                        | Q17. Did you discuss and agree with the physiotherapist about your short-term/long-term goals related to your hip/knee OA? Yes/No/Don't remember                                                                                                             | Q17 was captured in item #5.                                                                                                                                                                                                                                                                       |
| R12. Incorporate strategies to optimize adherence to treatment recommendations (for example, offer booster sessions to increase adherence to exercise).                                                                                                       |                                                                                                                                                                                                                                                        | Q8c. If you answered 'yes' to question 8a, did the physiotherapist discuss with you ways to help you adhere to your exercise/physical activity program? Yes/No/Don't remember                                                                                | Item #12. Did a physiotherapist discuss ways to help you stick to a specific exercise program? Yes/No/Don't remember/Don't have an exercise program                                                                                                                                                |
| R13. Discuss the risks and benefits of treatment options with the person, taking into account comorbidities. Ensure that information provided can be understood.                                                                                              | Have you been given information about different treatment alternatives? Yes/No/Don't remember                                                                                                                                                          | Q4. Did the physiotherapist give you information/advice about the risk and benefits of different treatment options for your hip/knee OA? Yes/No/Don't remember<br>Q2. Did the physiotherapist ask about your other medical conditions? Yes/No/Don't remember | Item #9. Did a physiotherapist discuss different treatment options available to manage your OA including the risk and benefits involved? Yes/No/Don't remember<br>Item #2. Did a physiotherapist ask about any other medical conditions (such as heart problem or diabetes)? Yes/No/Don't remember |
| R14. When discussing joint surgery, check the person has been offered at least the core treatments for OA, and give information about the benefits and risks of surgery and the potential consequences of not having surgery, recovery and rehabilitation.    | If you are severely troubled by your joint pain, and exercise and medicine do not help, have you been offered a discussion about the benefits and risks of a joint replacement operation with a health care professional? Yes/No/Not severely troubled | Q19. If you are severely troubled by your hip/knee OA, and exercise and medicine do not help, did the physiotherapist have a discussion with you about the benefits and risks of a joint replacement operation? Yes/No/Don't remember/No such problems       | Q19 was partly captured in item #9. It was difficult for patients to decide when it is appropriate to have such discussion.                                                                                                                                                                        |

| Extracted recommendations according to their rankings (Teo, Hinman, Egerton, Dziedzic, & Bennell, 2019) – Stage 1                                                                                                         | Quality indicators from Blackburn et al. (2016) – Stage 1                                                                                                                                                                         | Quality indicators for focus groups – Stage 2                                                                                                                                                                                                                                                                                                                           | Final quality indicators for the QUIPA tool                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R16. Offer interventions to achieve weight loss as a core treatment for people who are obese or overweight, incorporating individualised strategies that are recognised to effect successful weight loss and maintenance. | If you are overweight, have you been offered a referral to services for losing weight (e.g. a dietician or a weight-loss group)?<br>Yes/No/Not overweight                                                                         | Q9b. If you answered 'yes' to question 9a, did the physiotherapist offer you any weight loss strategies or a referral to services for losing weight (such as a dietician or a weight-loss group)? Yes/No/Don't remember                                                                                                                                                 | Item #13b. If you answered 'yes' to question 13a, did a physiotherapist discuss ways to lose weight (such as seeing a dietician or joining a weight-loss group)?<br>Yes/No/Don't remember                                                                                                                                                                                                            |
| R20. Manage any psychological distress of the person (for example, referral to another health professional if required).                                                                                                  |                                                                                                                                                                                                                                   | Q13. If you are feeling anxious, stressed, depressed and/or losing interest in activities you previously enjoyed, did the physiotherapist offer you a referral to another health professional who may be able to assist you with this? Yes/No/Don't remember/ No such problems                                                                                          | Item #4. If you are feeling anxious, stressed, down, depressed and/or have lost interest in activities you previously enjoyed, did a physiotherapist offer you a referral to another health professional who may be able to assist you with this? Yes/No/Don't remember/ No such problems                                                                                                            |
| R23. Consider the use of walking aids, assistive technology and adaptations at home and/or at work to reduce pain and increase participation.                                                                             | If you have problems with walking, has your need for a walking aid (e.g. stick, crutch or walker) been assessed? Yes/no/no such problems                                                                                          | Q10. If you have difficulty with walking, did the physiotherapist discuss with you the option of a walking aid (such as stick, crutch or walker)?<br>Yes/No/Don't remember/ No such problems                                                                                                                                                                            | Item #14. If you have difficulty with walking, did a physiotherapist discuss the option of a walking aid (such as stick, crutch or walker)? Yes/No/Don't remember/ No such problems                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                           | If you have problems with other activities of daily living, has your need for appliances and aids (e.g. splints, assistive technology for cooking or personal hygiene, a special chair) been assessed?<br>Yes/No/No such problems | Q11. If you have problems with daily activities, did the physiotherapist discuss with you the option of appliances and aids (such as assistive technology for personal hygiene or a special chair) or offer you a referral to another health professional who may be able to assist with this (such as occupational therapist)? Yes/No/Don't remember/ No such problems | Item #15. If you have problems with daily activities, did a physiotherapist discuss the option of appliances and aids (such as assistive devices for personal hygiene, for example a special chair to assist you when showering) or offer you a referral to another health professional who may be able to assist with this (such as occupational therapist)? Yes/No/Don't remember/No such problems |
| R24. For people who are at risk of work disability or who want to start/return to work, provide them with rapid access to vocational rehabilitation, including counselling about modifiable work-related factors.         |                                                                                                                                                                                                                                   | Q12. If you have problems with performing your job due to your hip/knee OA, did the physiotherapist offer you any work-related advice or a referral to another health professional or service that may be able to assist with this (such as occupational rehabilitation)? Yes/No/Don't remember/No such problems/ not working                                           | Item #16. If you are employed and have problems with performing your job due to your OA, did a physiotherapist offer you any work-related advice or a referral to another health professional or service that may be able to assist with this (such as occupational rehabilitation)? Yes/No/Don't remember/No such problems/Not employed                                                             |

| Extracted recommendations according to their rankings (Teo, Hinman, Egerton, Dziedzic, & Bennell, 2019) – Stage 1                                                                                                                                                                                                                    | Quality indicators from Blackburn et al. (2016) – Stage 1                                                                                              | Quality indicators for focus groups - Stage 2                                                                                                                        | Final quality indicators for the QUIPA tool                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R25. Offer regular reviews to all people with symptomatic OA. Agree the timing of the reviews with the person.                                                                                                                                                                                                                       | 18. Have you discussed and agreed with your health professional when you will have a review of your joint pain and treatment?<br>Yes/No/Don't remember | Q18. Did you discuss and agree with the physiotherapist about when you will have another appointment to review your hip/knee OA and treatment? Yes/No/Don't remember | Item #6. Did a physiotherapist discuss and suggest when you should seek another physiotherapy appointment for your OA? Yes/No/Don't remember                                      |
| R26. Screen for depression using an accepted depression screening tool.                                                                                                                                                                                                                                                              |                                                                                                                                                        | Q14. Did the physiotherapist ask you to complete a questionnaire that asks you about your mood?<br>Yes/No/Don't remember                                             | Item #3. Did a physiotherapist ask if you are feeling anxious, stressed, down, depressed and/or have lost interest in activities you previously enjoyed?<br>Yes/No/Don't remember |
| R29. Offer the person advice on appropriate and comfortable shoes.                                                                                                                                                                                                                                                                   |                                                                                                                                                        | Q15. Did the physiotherapist offer you advice on appropriate and comfortable shoes? Yes/No/Don't remember                                                            | Item #17. Did a physiotherapist offer you advice on appropriate and comfortable footwear? Yes/No/Don't remember                                                                   |
| R30. Do not offer herbal supplements to people with hip and/or knee OA.                                                                                                                                                                                                                                                              |                                                                                                                                                        | Q20. Did the physiotherapist advise you to take herbal supplements for your hip/knee OA (such as fish oil, glucosamine)?<br>Yes/No/don't remember (reverse scoring)  | In light of emerging evidence when this project was going on, the evidence base for Q20 was not strong so it was discarded.                                                       |
| <sup>a</sup> Part of this recommendation was no addressed in this specific quality indicator. Please refer to Appendix 2 for further explanation.<br>R: Ranked recommendation<br>OA: Osteoarthritis<br>Q: Quality indicator (draft version)<br>QUIPA: Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis |                                                                                                                                                        |                                                                                                                                                                      |                                                                                                                                                                                   |

**Additional file 2:** These recommendations from the consensus study [28] that identified the clinical guideline recommendations most relevant to physiotherapy practice were not used to develop quality indicators for physiotherapy management of hip and knee osteoarthritis.

| Recommendations according to their rankings from Teo et al. (2019) excluded from this study                                                                                                                                                                                                                     | Reasons for exclusion                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R1. Offer advice on the following core treatments to all people with clinical OA: access to appropriate information, activity and exercise, and interventions to achieve weight loss if the person is overweight or obese.                                                                                      | Other core treatments except weight loss were captured in Q3, 4, 5, 6, 7 & 8a.                                                                                                                                                                                                                                                                      |
| R4. Agree a plan with the person (and family members/carers) for managing OA, individualised according to the wishes and expectations of the individual, localisation of OA, risk factors, presence of inflammation, structural change, pain, activity restriction, societal participation and quality of life. | The statement about 'individualised plan' was discarded as it was difficult to assess in a physiotherapy consultation. We felt it would be difficult to assess if patient's plan was personalised according to their clinical presentations.                                                                                                        |
| R5. Offer accurate verbal and written information to enhance understanding of OA and its management, pain experience and to counter misconceptions. Ensure that information sharing is an ongoing, integral part of the management plan rather than a single event at time of presentation.                     | The second statement was discarded as it was difficult to capture comprehensively. We felt that it was difficult to assess if a physiotherapist was sharing OA information with a patient on an ongoing basis.                                                                                                                                      |
| R6. Ensure that the person with OA has been offered at least the core (non-surgical) treatment options before referring the person for consideration of joint surgery.                                                                                                                                          | This statement was discarded as physiotherapists are not able to execute this in the Australian health system.                                                                                                                                                                                                                                      |
| R7. Assess the effect of OA on the person's function, quality of life, occupation, mood, relationships and leisure activities and assess health education needs, health beliefs and motivation to self-manage.                                                                                                  | The statement on 'assess health education needs, health beliefs and motivation to self-manage' was discarded as it was difficult to assess in a physiotherapy consultation. We felt that patient might not know what their health education needs were and how their health beliefs and motivation to self-manage would affect their OA management. |
| R8. Agree individualised self-management strategies with the person with OA. Ensure that positive behavioural changes, such as exercise, weight loss, use of suitable footwear and pacing are appropriately targeted.                                                                                           | The second statement was discarded as it was difficult to assess in a physiotherapy consultation. We felt that it was difficult to assess if behaviour change strategies were implemented by a physiotherapist.                                                                                                                                     |
| R9. Ensure that self-management programmes for people with OA, either individually or in groups, emphasise the recommended core treatments, especially exercise.                                                                                                                                                | This statement was discarded because it was related to a health service program.                                                                                                                                                                                                                                                                    |
| R10. When lifestyle changes are recommended, offer people an individually tailored programme, including long-term and short-term goals, intervention or action plan, and regular evaluation and follow-up with possibilities for adjustment of the programme.                                                   | The statement 'follow up' was captured in Q18.                                                                                                                                                                                                                                                                                                      |
| R11. Teach a regular individualised exercise regimen that includes strengthening (sustained isometric) exercise for both legs, including the quadriceps and proximal hip girdle muscles, aerobic activity and exercise as well as adjunctive range of movement/stretching exercise.                             | Captured in Q6, 7 & 8a.                                                                                                                                                                                                                                                                                                                             |
| R15. Be aware that atypical features, such as a history of trauma, prolonged morning joint-related stiffness, rapid worsening of symptoms or the presence of a hot swollen joint, may indicate alternative or additional diagnoses.                                                                             | This statement was discarded as it was difficult to assess in a physiotherapy consultation. We felt that it was difficult to assess if a physiotherapist was aware of any atypical features presented.                                                                                                                                              |
| R17. Select the mode of delivery of exercise education (e.g. individual 1:1 sessions, group classes, etc) and use of pools or other facilities according both to the preference of the person, local availability and cost.                                                                                     | Captured in Q8a & 8b.                                                                                                                                                                                                                                                                                                                               |
| R18. Take into account comorbidities that compound the effect of OA when formulating the management plan.                                                                                                                                                                                                       | This statement was discarded as it was difficult to assess in a physiotherapy consultation. We felt that patient might not know the effect of comorbidities on their OA. However, this statement was partly captured in Q2.                                                                                                                         |
| 19. Consider referral for joint surgery for people with OA who experience joint symptoms (pain, stiffness and reduced function) that have a substantial impact on their quality of life and are refractory to non-surgical treatment.                                                                           | This statement was discarded as physiotherapists are not able to execute this in the Australian health system.                                                                                                                                                                                                                                      |
| 21. Diagnose OA clinically without investigations (when a person is 45 or over, has activity-related joint pain and has either no morning joint-related stiffness or morning stiffness that lasts no longer than 30 minutes).                                                                                   | This statement was discarded as it was difficult to assess in a physiotherapy consultation. We felt that it was difficult to assess if a physiotherapist was diagnosing a patient based on their clinical presentations.                                                                                                                            |
| 22. Do not refer for arthroscopic lavage and debridement as part of treatment for osteoarthritis, unless the person has knee OA with a clear history of mechanical locking (as opposed to morning joint stiffness, 'giving way' or X-ray evidence of loose bodies).                                             | This statement was discarded as physiotherapists are not able to execute this in the Australian health system.                                                                                                                                                                                                                                      |
| 27. Consider an annual review for any person with one or more of the following: troublesome joint pain, more than one joint with symptoms, more than one comorbidity and/or taking regular medication for their osteoarthritis.                                                                                 | Captured in Q18.                                                                                                                                                                                                                                                                                                                                    |
| 28. Base decisions on referral thresholds for joint replacement surgery on discussions between patient representatives, referring clinicians and surgeons, rather than using scoring tools for prioritisation.                                                                                                  | This statement was discarded as physiotherapists are not able to execute this in the Australian health system.                                                                                                                                                                                                                                      |
| R: Ranked recommendation<br>OA: Osteoarthritis<br>Q: Quality indicator (draft version) – the draft version of the quality indicator can be found in Additional file 1                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                     |

**Additional file 3:** Characteristics of participants in the focus groups (n= 15)

|                                              | <b>Mean (SD) or n (%)</b> |
|----------------------------------------------|---------------------------|
| <b>Female</b>                                | 12 (80%)                  |
| <b>Age</b>                                   | 63.9 (9.1)                |
| <b>Education</b>                             |                           |
| -Less than three years of high school        | 1 (7%)                    |
| -Three years or more of high school          | 1 (7%)                    |
| -Some tertiary training                      | 4 (27%)                   |
| -Graduated from university or polytechnic    | 2 (13%)                   |
| -Any post-graduate study                     | 7 (47%)                   |
| <b>Joint(s) affected by osteoarthritis</b>   |                           |
| -Hip                                         | 0 (0%)                    |
| -Knee                                        | 8 (53%)                   |
| -Hip and knee                                | 7 (47%)                   |
| <b>Knee pain (NRS)</b>                       | 4.9 (2.2)                 |
| <b>Restriction to daily activities (NRS)</b> | 3.4 (2.2)                 |

SD: standard deviation

n: number of participants

NRS: numeric rating scale; ranges from 0 to 10 where lower scores indicate less pain or restriction to daily activities

**Additional file 4:** Characteristics of participants in the validation study (n= 65)

|                                                            | <b>Mean (SD) or n (%)</b> |
|------------------------------------------------------------|---------------------------|
| <b>Female</b>                                              | 41 (63%)                  |
| <b>Age</b>                                                 | 64.5 (8.1)                |
| <b>Body mass index (kg/m<sup>2</sup>)</b>                  | 29.6 (6.5)                |
| <b>Comorbidity</b>                                         |                           |
| -Had one other chronic disease <sup>a</sup>                | 7 (11%)                   |
| -No other chronic diseases                                 | 58 (89%)                  |
| <b>Education</b>                                           |                           |
| -Less than three years of high school                      | 1 (2%)                    |
| -Three years or more of high school                        | 7 (11%)                   |
| -Some tertiary training                                    | 15 (23%)                  |
| -Graduated from university or polytechnic                  | 26 (40%)                  |
| -Any post-graduate study                                   | 16 (25%)                  |
| <b>Joint(s) affected by osteoarthritis (self-reported)</b> |                           |
| -Hip                                                       | 3 (5%)                    |
| -Knee                                                      | 52 (80%)                  |
| -Hip and knee                                              | 10 (15%)                  |
| <b>Pain (WOMAC)</b>                                        | 5.9 (3.0)                 |
| <b>Physical function (WOMAC)</b>                           | 35.5 (11.0)               |

SD: standard deviation

n: number of participants

WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; pain subscale ranges from 0 to 20 and physical function subscale ranges from 0 to 68, where lower scores indicate less pain and better function respectively

<sup>a</sup>Included diabetes (n= 4), tumour (n= 2), leukemia (n= 1)

**Additional file 5:** Characteristics of physiotherapists in the validation study (n= 9)

|                                                                                    | <b>Mean (SD) or n (%)</b> |
|------------------------------------------------------------------------------------|---------------------------|
| <b>Female</b>                                                                      | 4 (44%)                   |
| <b>Age</b>                                                                         | 34.3 (10.1)               |
| <b>Number of years in clinical practice</b>                                        |                           |
| ≤ 10 years                                                                         | 5 (56%)                   |
| 11-20 years                                                                        | 3 (33%)                   |
| 31-40 years                                                                        | 1 (11%)                   |
| <b>Average number of clinical practice hours weekly</b>                            |                           |
| 11-20 hours                                                                        | 2 (22%)                   |
| 21-30 hours                                                                        | 1 (11%)                   |
| 31 hours and above                                                                 | 6 (67%)                   |
| <b>Average number of patients with hip and/or knee osteoarthritis seen monthly</b> |                           |
| ≤ 5 people                                                                         | 3 (33%)                   |
| 6- 9 people                                                                        | 1 (11%)                   |
| ≥ 10 people                                                                        | 5 (56%)                   |

SD: standard deviation

n: number of participants

**Additional file 6: Construct validity analyses based on three predefined hypotheses**

| Hypotheses (based on patient week one data)                                                                                                                                                     | Analysis Value                                                                                                                                                                                                | Hypothesis confirmed? |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 1. People responding 'not overweight' on item #13a are more likely to report BMI < 25 (not overweight) than people responding 'yes', 'no' or 'don't remember'                                   | t = 22.1 P < 0.001<br>12 (selected 'not overweight') versus 2 (selected 'yes', 'no' or 'don't remember') reporting BMI < 25<br>n = 20 versus 45                                                               | Yes                   |
| 2. People responding 'no such problems' on item #14 are likely to score '0' with walking item (WOMAC item 11 -walking on a flat surface) than people responding 'yes', 'no' or 'don't remember' | t = 7.5 P < 0.01<br>n = 16 (selected 'no such problems') versus 5 (selected 'yes', 'no' or 'don't remember') scoring '0' with walking item<br>n = 32 versus 33                                                | Yes                   |
| 3. People responding 'no such problems' on item #15 have on average a lower total physical function score for WOMAC than people responding 'yes', 'no' or 'don't remember'                      | Mean value (SD): 33.1 (9.8) vs 39.2 (11.8) <sup>a</sup><br>Mean difference (95% CI):<br>6.1 (0.7, 11.5) P < 0.05<br>n = 39 (selected 'no such problems') versus 26 (selected 'yes', 'no' or 'don't remember') | Yes                   |

BMI: Body mass index (kg/m<sup>2</sup>)

QI: Quality Indicator in the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool. The complete quality indicator corresponding to each number can be found in Table 1.

WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; walking item ranges from 0 to 4, where lower score indicates lesser difficulty with walking

n: number of participants

P: probability value

Chi-square test (t)

<sup>a</sup>Independent T-test

**Additional file 7:** Pass rates for individual quality indicators reported by physiotherapists (n= 65)

| Quality Indicators <sup>a</sup> | Other answers <sup>b</sup> except 'yes' and 'no' | Missing data | Eligible persons <sup>c</sup> | Quality Indicator pass rates <sup>d</sup> |        |
|---------------------------------|--------------------------------------------------|--------------|-------------------------------|-------------------------------------------|--------|
|                                 |                                                  |              |                               | 'Yes' (%)                                 | 95% CI |
| 1. Osteoarthritis assessment    | -                                                | -            | 65                            | 57 (87.7%)                                | 80-95  |
| 2. Comorbidities                | 2                                                | -            | 63                            | 42 (66.7%)                                | 56-79  |
| 3. Depression screening         | -                                                | -            | 65                            | 8 (12.3%)                                 | 5-22   |
| 4. Depression referral          | 41                                               | -            | 24                            | 4 (16.7%)                                 | 4-33   |
| 5. Management plan              | -                                                | -            | 65                            | 58 (89.2%)                                | 82-95  |
| 6. Physiotherapy review         | 1                                                | -            | 64                            | 41 (64.1%)                                | 52-75  |
| 7. Osteoarthritis definition    | -                                                | -            | 65                            | 48 (73.8%)                                | 63-85  |
| 8. Osteoarthritis pain          | -                                                | -            | 65                            | 43 (66.2%)                                | 54-79  |
| 9. Treatment risk & benefits    | 1                                                | -            | 64                            | 39 (60.9%)                                | 48-72  |
| 10. Exercise prescription       | 6                                                | -            | 59                            | 49 (83.1%)                                | 73-92  |
| 11. Exercise preference         | -                                                | -            | 65                            | 56 (86.2%)                                | 77-94  |
| 12. Exercise adherence          | -                                                | 10           | 55                            | 33 (60.0%)                                | 46-73  |
| 13. a. Benefits of weight loss  | 32                                               | -            | 33                            | 19 (57.6%)                                | 39-73  |
| b. Strategies for weight loss   | 1                                                | 46           | 18                            | 12 (66.7%)                                | 44-89  |
| 14. Walking aid                 | 39                                               | -            | 26                            | 13 (50.0%)                                | 31-69  |
| 15. Appliances and aids         | 46                                               | -            | 19                            | 2 (10.5%)                                 | 0-26   |
| 16. Work advice                 | 51                                               | -            | 14                            | 5 (35.7%)                                 | 14-64  |
| 17. Footwear advice             | -                                                | -            | 65                            | 24 (36.9%)                                | 25-49  |

95% CI: 95% confidence interval

n: number of participants

<sup>a</sup>The complete quality indicator corresponding to each number can be found in Table 1.

<sup>b</sup>Don't remember/No such problems/ Already doing own exercise program/ Don't have an exercise program/ Not overweight/ not employed

<sup>c</sup>Total study sample minus missing data/ Don't remember/No such problems/ Already doing own exercise program/ Don't have an exercise program/ Not overweight/ not employed

<sup>d</sup>Eligible persons reporting 'yes'

**Additional file 8:** Pass rates for individual quality indicators reported by patients at Week 1 (n= 65)

| Quality Indicators <sup>a</sup> | Other answers <sup>b</sup> except 'yes' and 'no' | Missing data | Eligible persons <sup>c</sup> | Quality Indicator pass rates <sup>d</sup> |        |
|---------------------------------|--------------------------------------------------|--------------|-------------------------------|-------------------------------------------|--------|
|                                 |                                                  |              |                               | 'Yes' (%)                                 | 95% CI |
| 1. Osteoarthritis assessment    | 8                                                | -            | 57                            | 55 (96.5%)                                | 91-100 |
| 2. Comorbidities                | 6                                                | -            | 59                            | 48 (81.4%)                                | 71-92  |
| 3. Depression screening         | 12                                               | -            | 53                            | 9 (17.0%)                                 | 8-28   |
| 4. Depression referral          | 45                                               | -            | 20                            | 3 (15.0%)                                 | 0-30   |
| 5. Management plan              | 4                                                | -            | 61                            | 48 (78.7%)                                | 67-89  |
| 6. Physiotherapy review         | 6                                                | -            | 59                            | 18 (30.5%)                                | 19-42  |
| 7. Osteoarthritis definition    | 4                                                | -            | 61                            | 47 (77.0%)                                | 66-87  |
| 8. Osteoarthritis pain          | 5                                                | -            | 60                            | 47 (78.3%)                                | 67-88  |
| 9. Treatment risk and benefits  | 7                                                | -            | 58                            | 41 (70.7%)                                | 59-81  |
| 10. Exercise prescription       | 8                                                | -            | 57                            | 55 (96.5%)                                | 91-100 |
| 11. Exercise preference         | 5                                                | -            | 60                            | 51 (85.0%)                                | 75-93  |
| 12. Exercise adherence          | 7                                                | 2            | 56                            | 33 (58.9%)                                | 46-73  |
| 13. a. Benefits of weight loss  | 21                                               | -            | 44                            | 20 (45.5%)                                | 32-61  |
| b. Strategies for weight loss   | -                                                | 45           | 20                            | 15 (75.0%)                                | 55-95  |
| 14. Walking aid                 | 34                                               | -            | 31                            | 15 (48.4%)                                | 29-65  |
| 15. Appliances and aids         | 41                                               | -            | 24                            | 7 (29.2%)                                 | 13-50  |
| 16. Work advice                 | 48                                               | -            | 17                            | 3 (17.6%)                                 | 0-35   |
| 17. Footwear advice             | 4                                                | -            | 61                            | 21 (34.4%)                                | 23-46  |

95% CI: 95% confidence interval

n: number of participants

<sup>a</sup>The complete quality indicator corresponding to each number can be found in Table 1.

<sup>b</sup>Don't remember/No such problems/ Already doing own exercise program/ Don't have an exercise program/ Not overweight/ not employed

<sup>c</sup>Total study sample minus missing data/ Don't remember/No such problems/ Already doing own exercise program/ Don't have an exercise program/ Not overweight/ not employed

<sup>d</sup>Eligible persons reporting 'yes'

**Additional file 9:** Frequency of ‘yes’, ‘no’ and ‘don’t remember’ responses for QI on osteoarthritis assessment (item #1) compared to QI for osteoarthritis pain (item #8) at Week 12 and 13.

| Item #1:<br>osteoarthritis<br>assessment |                   | W13 |    |                   |
|------------------------------------------|-------------------|-----|----|-------------------|
|                                          |                   | Yes | No | Don’t<br>remember |
| W12                                      | Yes               | 43  | 3  | 3                 |
|                                          | No                | 4   | 5  | 0                 |
|                                          | Don’t<br>remember | 3   | 1  | 1                 |

| Item #8:<br>osteoarthritis<br>pain |                   | W13 |    |                   |
|------------------------------------|-------------------|-----|----|-------------------|
|                                    |                   | Yes | No | Don’t<br>remember |
| W12                                | Yes               | 34  | 4  | 3                 |
|                                    | No                | 2   | 10 | 0                 |
|                                    | Don’t<br>remember | 5   | 1  | 4                 |

QI = Quality Indicator in the Quality Indicators for Physiotherapy Management of Hip and Knee Osteoarthritis (QUIPA) tool. The complete quality indicator corresponding to each number can be found in Table 1.

## Appendix E

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**Physiotherapists may improve management of knee osteoarthritis through greater psychosocial focus, being proactive with advice, and offering longer-term reviews: a qualitative study**

**Author:**

Pek Ling Teo, Kim L Bennell, Belinda J Lawford, Thorlene Egerton, Krysia S Dziedzic, Rana S Hinman

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## Appendix F

## Supplementary material – Chapter Six

Supplementary File 1: An audit trail of evidence showing examples of each stage of the data analysis

| Original data (Individually assessed by two researchers)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Code/category (generated by the two researchers)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Sub-theme (based on discussion between the researchers)                                                                                                                            | Theme (based on discussion between the researchers)          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- We started with x-rays, and that was done by my general practitioner</li> <li>- First of all, I went to a knee specialist and then I went to a sports medicine specialist and orthopaedic surgeon</li> <li>- Initially I went to the orthopaedic surgeon</li> <li>- I went to a specialist in this</li> <li>- I did a course with Dr L, who is a rheumatologist</li> <li>- I suffered quite a bit of pain and I was referred to a specialist</li> <li>- I went to see a surgeon with the possible view of having replacements done</li> <li>- If it's bone on bone that doesn't replace the cartilage</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>general practitioner</li> <li>knee specialist, sports medicine specialist, orthopaedic surgeon</li> <li>orthopaedic surgeon</li> <li>specialist</li> <li>rheumatologist</li> <li>specialist</li> <li>surgeon</li> <li>Bone on bone, no cartilage</li> </ul>                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li><i>Prior osteoarthritis care from other health professionals</i></li> <li><i>Perception of adequate osteoarthritis knowledge</i></li> </ul> | Presented with a pre-existing osteoarthritis diagnosis       |
| <ul style="list-style-type: none"> <li>- I've got a fair bit of wear and tear but because of my age</li> <li>- It's just basically wear and tear, and it's really bone on bone</li> <li>- I've had all those tests. So I had all that and that's when they discovered [osteoarthritis]</li> <li>- My understanding is it's really just a bit of integral wear and tear of the joint</li> <li>- I have a fairly good understanding of what osteoarthritis</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Wear and tear due to age</li> <li>Wear and tear, bone on bone</li> <li>Tests to confirm osteoarthritis</li> <li>Understanding, wear and tear</li> <li>Good understanding of osteoarthritis</li> </ul>                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                    |                                                              |
| <ul style="list-style-type: none"> <li>- I just chose them because I knew they did Pilates and exercise rehab</li> <li>- follow up physiotherapy after the arthroscopy</li> <li>- it [physiotherapy] was convenient because it was near my general practitioner</li> <li>- Probably word of mouth</li> <li>- I've actually had a work injury, so that [physiotherapy] was actually paid through my injury</li> <li>- That [physiotherapy] was part of an advanced health care plan</li> <li>- The general practitioner sent me to a physiotherapist</li> <li>- I went to see a knee specialist, he suggested that physiotherapy might help strengthen the muscles</li> <li>- I got them off the EPC Plan</li> <li>- Subsidised by my health insurance</li> <li>- I've got private health cover, so I paid a gap</li> <li>- WorkCover then ceased to cover me</li> <li>- I've actually had a work injury, so that was actually paid through my injury</li> <li>- I was doing them myself out-of-pocket</li> <li>- I actually participated in the GLA:D programme</li> <li>- They [the physiotherapist] wanted me to do the pilates in the group</li> <li>- trying to get me involved in aqua aerobics</li> <li>- The first has been my regular physio who I've seen for probably about four years</li> </ul> | <ul style="list-style-type: none"> <li>Self-referral</li> <li>Rehabilitation program</li> <li>Self-referral</li> <li>Peer recommendation</li> <li>Through work compensation scheme</li> <li>Referred by doctor</li> <li>Referred by doctor</li> <li>Referred by specialist</li> <li>Medicare subsidy</li> <li>Health insurance</li> <li>Health insurance</li> <li>Work compensation scheme</li> <li>Work compensation scheme</li> <li>Self-funded</li> <li>Group setting</li> <li>Group setting</li> <li>Group setting</li> <li>1:1</li> </ul> | <ul style="list-style-type: none"> <li><i>Referral pathways</i></li> <li><i>Funding models</i></li> <li><i>Individual vs group sessions</i></li> </ul>                             | Wide variation in access and provision of physiotherapy care |

## Appendix F

|                                                                                                                                                                                                                              |                                              |                                                             |                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|
| - continuing with intermittent physiotherapy sessions as well as exercising at home                                                                                                                                          | 1:1                                          |                                                             |                                                                |
| - as part of the bike fit the physio did a full-on assessment                                                                                                                                                                | 1:1                                          |                                                             |                                                                |
| - the pain was just killing me. I would be in tears with the pain.                                                                                                                                                           | Knee pain                                    | <i>Knee symptoms</i>                                        | Seeking physiotherapy care for pain and functional limitations |
| - I wanted to go and build-up the strength in my legs                                                                                                                                                                        | Knee weakness                                |                                                             |                                                                |
| - I've had this really sore knee that's basically collapsing underneath                                                                                                                                                      | Knee pain and weakness                       |                                                             |                                                                |
| - it was swollen, hot, and I couldn't walk without a walking stick. It was very painful                                                                                                                                      | Knee swelling, pain                          |                                                             |                                                                |
| - Loss of support. I was having trouble, I was struggling walking because the knee would just suddenly give way, and I'd fall down                                                                                           | Knee weakness, poor support                  |                                                             |                                                                |
| - my knees were becoming more and more sore and clicking as I walked                                                                                                                                                         | Knee pain, clicking                          |                                                             |                                                                |
| - my knees were becoming more and more sore and clicking as I walked, particularly up sets of stairs                                                                                                                         | Difficulty with steps negotiation            | <i>Functional problems</i>                                  |                                                                |
| - my gait's not very good and it's throwing my back out. I was heading overseas and thought I've got to do something about this, I can't be hobbling around.                                                                 | Walking difficulty                           |                                                             |                                                                |
| - I could not stand up out the chair unaided                                                                                                                                                                                 | Difficulty getting off the chair             |                                                             |                                                                |
| - I was struggling to walk                                                                                                                                                                                                   | Walking difficulty                           |                                                             |                                                                |
| - Because I've lost capacity to squat                                                                                                                                                                                        | Difficulty squatting                         |                                                             |                                                                |
| - I think she [the physiotherapist] made me walk a little bit                                                                                                                                                                | Gait assessment                              | <i>Assessment of function</i>                               | Physiotherapy management focussed on function and exercise     |
| - They'll [the physiotherapist] get you to do a few activities to try and I guess test the limits of what you can and can't do with your knee – squatting, bending, rotation                                                 | Functional tasks                             |                                                             |                                                                |
| - timing or just observing, getting in and out of a chair                                                                                                                                                                    | Functional tasks                             |                                                             |                                                                |
| - the [physiotherapist] just got me doing step-ups                                                                                                                                                                           | Steps assessment                             |                                                             |                                                                |
| - the [physiotherapist] got me to walk straight away from him and then turn around and come straight back towards him                                                                                                        | Gait assessment                              |                                                             |                                                                |
| - she [the physiotherapist] recommended to keep riding the pushbike                                                                                                                                                          | Bike, cardio                                 | <i>Various types of exercises prescribed</i>                |                                                                |
| - we went to the hydro                                                                                                                                                                                                       | Hydrotherapy                                 |                                                             |                                                                |
| - advised me to walk in the pool, go on the exercise bike, those sorts of things                                                                                                                                             | Water exercise, bike, cardio                 |                                                             |                                                                |
| - to walk on the treadmill for five minutes as a warmup                                                                                                                                                                      | Gym workout                                  |                                                             |                                                                |
| - she's [the physiotherapist] given me stretching exercises with a rubber band                                                                                                                                               | Theraband                                    |                                                             |                                                                |
| - the [the physiotherapist] gave me, swimming, wall press ups, yeah, biceps, standing with dumbbells, and bridge, lie on your back, clamshells, wall squats, single leg stance with eyes open, seated abduction ball squeeze | Swimming, functional exercise, strengthening |                                                             |                                                                |
| - I think it's the rheumatologist or my general practitioner probably, they would be the ones that would be issuing the drugs so I didn't think that would be a physio's                                                     | Medication is GP's role                      | <i>Surgery, medications, and injections are for doctors</i> |                                                                |
| - I get the impression the physio doesn't want to go into the drug side of it because of the risks                                                                                                                           | Medication is not the physiotherapist's role |                                                             |                                                                |
| - the doctor had covered that [medication]. I didn't feel that I need my physio [needs] to                                                                                                                                   | Medication is GP's role                      |                                                             |                                                                |
| - No but it's not his [the physiotherapist] place to manage it. Medications, the doctor does that.                                                                                                                           | Medication is GP's role                      |                                                             |                                                                |
| - Because the surgeon will know better about how advanced it is                                                                                                                                                              | Surgery is the specialist's role             |                                                             |                                                                |
| - I remember him [physiotherapist] saying, your next point of call could be to go and speak to a physician who specialises in knees                                                                                          | Surgery is the specialist's role             |                                                             |                                                                |

## Appendix F

|                                                                                                                                                                                                 |                                                                    |                                |                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------|--------------------------------------------------|
| - They [the physiotherapist] said what you need to do is we're going to refer you to the doctor, and he can then make the best decision on what treatment should happen with your knee.         | Surgery is the specialist's role                                   |                                |                                                  |
| - She [the physiotherapist] did a little massage on my calf and my knee                                                                                                                         | Massage                                                            | <i>Adjunctive treatments</i>   |                                                  |
| - I think they've [the physiotherapist] played around with a TENs machine                                                                                                                       | TENS, electrotherapy                                               |                                |                                                  |
| - He [the physiotherapist] gave me exercises; put a little machine on my knee                                                                                                                   | Electrotherapy                                                     |                                |                                                  |
| - she [the physiotherapist] would do deep tissue massage for five to 10 minutes                                                                                                                 | Massage                                                            |                                |                                                  |
| - I had some strapping of the knee                                                                                                                                                              | Taping                                                             |                                |                                                  |
| - I think I would've got some, a little bit of ultrasound                                                                                                                                       | Ultrasound, electrotherapy                                         |                                |                                                  |
| - I think it's called EMS machine, an electronic stimulation machine                                                                                                                            | EMS, electrotherapy                                                |                                |                                                  |
| - she [the physiotherapist] had advised me to wear a Tubigrip, just pressure bandage over the knee                                                                                              | Tubigrip, knee bracing                                             |                                |                                                  |
| - He [the physiotherapist] was extremely good and I had complete trust in what he was doing                                                                                                     | Trust in the physiotherapist, confident                            | <i>Trust and/or confidence</i> | Professional and personalized care               |
| - I think we had quite a good relationship and he [the physiotherapist] also knew my background and what I'd been through                                                                       | Good relationship, trust                                           |                                |                                                  |
| - She [the physiotherapist] had an instant grasp of what was happening and what was needed to try and assist                                                                                    | Understood my concern, tried to help                               |                                |                                                  |
| - [The physiotherapist] was great and he was fairly well read and understanding of the situation                                                                                                | Competent, trust and confident                                     |                                |                                                  |
| - what I can say about my physio is that I think he has a very good understanding of my knee problem and I think he understands that better than my doctors                                     | Good relationship, understanding                                   |                                |                                                  |
| - They [the physiotherapist] were always very empathetic towards it                                                                                                                             | Empathetic                                                         |                                |                                                  |
| - I think she [the physiotherapist] understood what my concerns were, she looked at all those things and helped me with them.                                                                   | Specific to the concern, helped me                                 | <i>Personalized care</i>       |                                                  |
| - She [the physiotherapist] was always checking back with me to make sure that it was possible for me to do it or if I could cope with it or whatever the case was                              | Checking with me                                                   |                                |                                                  |
| - there was nothing that I wasn't confused about. And it was a two-way discussion                                                                                                               | Two-way discussion                                                 |                                |                                                  |
| - the [physiotherapist] assessed it best by working with me                                                                                                                                     | Working with me                                                    |                                |                                                  |
| - The surgeon said to me he probably gives me 10 years out of my right knee                                                                                                                     | Postpone surgery                                                   |                                | Physiotherapy to postpone or prepare for surgery |
| - I actually am going to go to the orthopaedic specialist in February to have a look and just see whether I should have a replacement                                                           | Intention for knee surgery, preparation                            |                                |                                                  |
| - My doctor just told me that I'm going to need a knee replacement eventually and so did the specialist surgeon, so I thought well I don't want to have a knee replacement just at this stage.  | Need a knee replacement but not at this stage, prepare for surgery |                                |                                                  |
| - We were talking about the advantages of doing it [surgery] sooner than later, but then he's [the physiotherapist] saying if I do it a bit later then we can strengthen the muscles in my knee | Prepare for surgery                                                |                                |                                                  |
| - I'm on a waiting list to have a knee replacement, but when that happens, who knows                                                                                                            | Waiting list for knee replacement                                  |                                |                                                  |

EMS: Electrical muscle stimulation

EPC: Enhanced primary care

GLA:D: Good Life with Osteoarthritis: Denmark (GLA:D)

TENS: Transcutaneous electrical nerve stimulation