

**Knee Osteoarthritis: A Critical Appraisal of Clinical Practice Guidelines and an
Investigation into the Self-Reported Clinical Practice of Physiotherapists Working in
Canada**

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A thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

In partial fulfillment of the requirement of the degree of

MASTER OF SCIENCE

The College of Rehabilitation Sciences

Rady Faculty of Health Sciences

University of Manitoba

Winnipeg, Manitoba

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Abstract

Background: As the incidence of knee osteoarthritis (OA) increases, physiotherapists can help people manage OA by utilizing clinical practice guidelines (CPGs) to recommend treatment options.

Purposes: 1) assess the quality of newly developed or recently updated CPGs for knee OA, 2) summarize the non-pharmacological recommendations in the CPGs, 3) establish self-reported clinical practice of physiotherapists in Canada, 4) investigate beliefs, barriers and facilitators pertaining to CPGs and 5) compare the clinical practice of physiotherapists with recommendations in the CPGs.

Methods: Two pairs of evaluators used the Appraisal of Guidelines for Research and Evaluation II (AGREE II) tool to appraise CPGs with non-pharmacological recommendations for people with knee OA. The included CPGs were published between January 2014 and January 2019. We conducted an online survey to investigate the clinical practice of physiotherapists and gather information on CPGs. Physiotherapists who were licensed to practice in Canada and treated people with knee OA were eligible to participate.

Results: A total of 10 clinical practice guidelines were included in the critical appraisal and six of those were deemed to be high quality. Nearly all guidelines recommended education, exercise and weight management for individuals with knee OA. Data from physiotherapists who responded to the survey (n = 388) indicated that almost all respondents provided education and strengthening exercises. Less than 60% offered aerobic exercise and weight-management advice. Of the respondents, 271 individuals were aware of CPGs and 253 reported they followed CPGs. As well, 204 respondents reported barriers and 117 reported facilitators to utilizing CPGs.

Conclusion: Most CPGs we appraised were high quality and agreed that education, exercise and weight-management advice should be standard recommendations offered to people with knee OA. Physiotherapists provided aspects of care that aligned with the core recommendations found in the CPGs, such as offering education and leg strengthening exercises. We recommend that physiotherapists who treat people with knee OA in Canada assess their clinical practice to ensure the care they provide is aligned with evidence-based research for people with knee OA thus helping people maximize their quality of life, mobility and function.

Key words: care-maps, knee osteoarthritis, knee osteo-arthritis, non-pharmacological/ non-surgical clinical practice guidelines, pathways, physiotherapy, recommendations

Acknowledgements

I would like to thank my advisor, Dr. Sandra Webber for her support, encouragement and the laughs we shared through-out this journey. I had been out of school for eleven years when I began my MSc in the fall of 2017. Dr. Webber provided a welcoming, judgement free and positive learning environment and because of that, I thoroughly enjoyed completing my MSc with her.

I would also like to thank my committee members, Drs. Kristy Wittmeier and David Robinson for their involvement in my thesis project. I appreciate that by agreeing to be on my committee, you took time away from your own research projects and clinical practice.

Thank-you to the Manitoba Physiotherapy Association and the Faculty of Graduate Studies for financial support during my thesis.

Lastly, a special thank-you to my family for your encouragement over the past two years.

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1 Introduction

As the most common form of arthritis that is diagnosed worldwide,^{1,2} osteoarthritis (OA) is a global health condition and the leading cause of lower extremity disability amongst older adults.³ Knee OA is more prevalent than hip OA¹ and carries an estimated lifetime risk of 40% for men and 47% for women.³ With an aging population and increasing obesity rates, the number of people expected to be living with OA will continue to increase in the upcoming years.⁴ A multi-disciplinary team approach involving physicians, physiotherapists, occupational therapists, dietitians, psychologists, podiatrists and nurse specialists is instrumental in helping people diagnosed with knee OA manage their symptoms associated with knee OA effectively.⁵ Regardless of the severity of knee OA, a non-pharmacological and non-surgical approach emphasizing exercise, weight-loss and education, should be the first line of treatment interventions recommended.⁵ Physiotherapists are optimally placed within the healthcare system to deliver some of the core non-pharmacological and non-surgical interventions to individuals who have knee OA. Clinical practice guidelines (CPGs) are evidence-based recommendations that physiotherapists can use to help enhance decision-making and deliver appropriate OA care. Adhering to CPGs may result in improved patient care and outcomes. No research currently exists that exclusively investigates if physiotherapists who treat people with knee OA in Canada follow CPGs. The aims of this study are to critically appraise the most recent or newly updated clinical practice guidelines for managing knee OA, to establish the self-reported clinical practice of physiotherapists who assess and treat people with knee OA in Canada and to compare the clinical practice of physiotherapists in Canada with the highest quality CPGs.

2 Literature Review

2.1 The current reality of osteoarthritis

2.1.1 Epidemiology of osteoarthritis

Osteoarthritis is the most prevalent form of arthritis that is diagnosed in general medical practice.^{3,5} According to the World Health Organization (WHO), OA is one of the most disabling musculoskeletal conditions in developed countries.⁶ In Canada, Birtwhistle et al⁷ found that 14.2% of the Canadian population were diagnosed with OA by a physician. As well, prevalence tends to be higher in women and those older than 50 years of age.⁷ For example, 23.4% of women age 60-69 have OA versus 16.7% of men.⁷ Bombardier, Hawker, & Mosher⁸ have shown that the most prevalent type of self-reported OA in Canadians is knee OA (29.4%), followed by hip and knee OA (28.7%), and hip OA (12.3%). In addition, individuals who have OA tend to have an increased risk of multi-morbidities such as cardiovascular disease,⁹ type 2 diabetes,¹⁰ hypertension, depression, chronic obstructive pulmonary disease and epilepsy.⁷ Incidences of OA are expected to increase dramatically over the next 30 years.⁸ By 2040, 26% of the Canadian population or 10 million Canadians are expected to be diagnosed with OA.⁸

2.1.2 Economic burden of osteoarthritis

The impact of OA on the economy is reflected in direct and indirect costs.⁸ Direct costs include those attributable to medical visits, diagnostic testing, hospitalizations, pharmacological management and comorbidities.⁸ Indirect costs of OA include wage based productivity losses and costs associated with disability.⁸ In 2010, the direct costs associated with OA to the Canadian economy were \$10.2 billion and the indirect costs were \$17.3 billion.⁸ As the incidence of OA increases over the next 30 years, the direct and indirect economic costs are

expected to increase substantially. By 2040, the direct costs to the Canadian economy are expected to rise to \$546 billion and the indirect costs will rise to \$909 billion.⁸

2.1.3 What is osteoarthritis?

Osteoarthritis (OA) is a progressive synovial joint disorder¹¹ that develops because of a chronic maladaptive remodeling process in the joint.¹² When a synovial joint sustains microtrauma or a microinjury, the joint demonstrates a unique ability to repair this microtrauma or injury, thus maintaining a dynamic balance between tissue repair and tissue breakdown.¹² When these stresses proceed at a pace that exceeds the capability of synovial joint tissue to restore itself, deterioration of the joint tissue occurs, resulting in structural and functional failure of the joint.¹² It was once thought that OA mainly involved the cartilage in a joint.^{11,13} It is now known that OA affects multiple structures that make up a synovial joint including the subchondral bone, menisci, ligaments, periarticular muscle, capsule and synovial fluid.^{3,13} The knees, hips and hands are the most commonly affected joints.¹³

2.1.4 Risk factors for osteoarthritis

According to Neogi and Zhang,¹⁴ the etiology of OA is multifactorial and different risk factors will work in combination together to contribute the onset of OA. Risk factors for the development of OA can be categorized into either person level or joint level.^{3,14} Person level risk factors are specific characteristics of an individual that contribute to the risk of developing OA and include age, sex, obesity, genetics, bone mineral density and nutritional factors.¹⁴

Prevalence of OA increases with age¹ but the exact mechanisms are not yet known.¹⁴ It is suspected that as an individual ages, the capacity of the joint to adapt to articular stresses is reduced resulting in a cascade of events leading to OA.¹⁴ As well, it has been demonstrated that

both female sex^{15,16} and genetic predisposition¹⁴ result in higher risk of OA, increased prevalence of OA and potentially greater severity of OA.^{14,16} In fact, research suggests genetics account for up to 40% of knee OA.¹⁷

Both females and males who are overweight or obese, have an increased the risk of developing knee OA versus those who are not.¹⁵ Furthermore, older women who are obese have been shown to have higher incidences of knee OA as compared to older men.¹⁵ Theories as to why rates of OA are higher in obese and over-weight individuals suggest that mechanical loading on the joint plays a role, as do systemic effects such as inflammation.¹⁴

Bone mineral density refers to the material properties of bone and may be a contributing factor to the increased risk of developing OA but the research is conflicted.¹⁴ Studies have demonstrated that both increased¹⁸ and decreased¹⁹ bone mineral density may play a role in increasing an individual's susceptibility to developing knee or hip OA. Like bone mineral density, the research discussing the role that nutritional factors such as vitamins D, K and C may play in increasing or decreasing the incidence or progression of knee OA are inconsistent.^{3,14} More research is needed to understand the relationship between nutritional factors, like vitamins, and the development and progression of knee OA.³

While person level risk factors are characteristic of the individual, joint level risk factors are unique to the joint and may include the type of occupation, physical activity, injury, muscle strength and alignment.¹⁴ Research indicates that occupational activities such as prolonged kneeling and squatting for ≥ 1 hour/ day for ≥ 1 year, and frequent lifting, increase the risk of knee OA in both men and women.²⁰ Furthermore, women who walk more than 2 miles/ day at work and men who climb ladders and stairs more than 30 times/ day at work, are at a higher risk of developing knee OA.²⁰ It is important to note that men and women employed in occupations

with prolonged kneeling and squatting and who developed knee OA also had higher rates of obesity²⁰ and this suggests that the relationship between occupational factors and knee OA are not straightforward.

The influence of physical activity on the risk of an individual developing knee OA is a complex interaction that involves more than just the biomechanical stress impacting the joint during activity.¹⁴ The likelihood of physical activity being a risk factor for developing knee OA depends on the existing vulnerability of the joint and the presence of other risk factors.¹⁴ Unlike recreational athletes, elite level athletes may be at a higher risk of developing knee OA if they compete in highly repetitive sport with increased impact forces on the knee and have sustained a previous injury to the knee.²¹

Traumatic knee injuries such as anterior cruciate ligament (ACL) tears have been shown to increase the risk of developing knee OA.²² In a study conducted by Lohmander et al,²² female soccer players who sustained an ACL tear in their teens, showed radiographic signs of OA in both the tibiofemoral and patella-femoral joints, and reported symptoms consistent with knee OA in the injured leg an average of 10 years after the original injury. Furthermore, isolated meniscus injuries have been shown to be associated with radiographic signs of knee OA in as little as 5 years after injury in those who are older than 30 years of age when first injured.²³

Decreased muscle strength, atrophy and altered activation of the quadriceps muscle have been found in individuals with knee OA,²⁴ but whether these deficits in the quadriceps muscle predispose an individual to developing knee OA remains unclear. Longitudinal research conducted in the United States of America demonstrated that weakness of the quadriceps muscle in women ≥ 65 years old may increase the risk of developing knee OA.²⁵ The researchers found that women who had normal radiographs but who were 15-18% weaker in their quadriceps

muscle at baseline testing were more likely to develop incident knee OA in the absence of atrophy within 2-3 years of baseline testing compared to women whose knee radiographs were normal.²⁵

Longitudinal research has repeatedly shown that varus knee alignment at baseline testing in men and women who have knee OA, increases the progression of medial joint knee OA.^{26,27} However, it was not until recently that research concluded that varus knee alignment at baseline testing does increase the incidence of tibiofemoral knee OA 2.5 years later in both men and women.²⁷ It is postulated that joint space narrowing alters that boney contours of the joint, which may result in malalignment thus altering the ability to accommodate to the joint stresses.¹⁴ This in turn may accelerate the progression of OA.¹⁴

While a number of person and joint level risk factors have been identified that may lead to OA, research suggests that certain risk factors are stronger predictors for the development of OA as compared to others.² For instance, increased age,^{1,2} female sex,^{2,5} increased obesity^{2,15} and traumatic knee injuries²² are considered the strongest predictors of OA.

2.1.5 Diagnosis and investigation

Osteoarthritis is diagnosed by the subjective history,⁵ the physical exam⁵ and radiographic findings.³ Individuals with OA report aching joint pain³ that increases with activity^{13,28} and decreases with rest,^{5,28} morning stiffness in the joint lasting 20-30 minutes,^{13,28} joint stiffness after prolonged sitting and walking,⁵ pain at night that interrupts sleep,²⁸ increased levels of fatigue,²⁸ functional impairments²⁸ and difficulty with activities of daily living.⁵ Individuals often have difficulty mobilizing which increases the reliance on others to assist with activities of daily living, resulting in a loss of independence,²⁹ loss of personal control over the disease, decreased self-efficacy, decreased feelings of self-worth, a lack of self-value, all of

which may lead to social isolation.³⁰ As well, individuals with knee OA have indicated that at times they have received little support from their family physician and other healthcare professionals, thus making them feel marginalized.²⁹

During a clinical exam, people with OA typically present with decreased joint range of motion, crepitus, joint deformity, joint swelling and joint line tenderness.^{13,28} Lastly, radiographic imaging indicates that a joint with OA is characterized by narrowing of the joint space,³¹ osteophytes and changes in the subchondral bone.¹³

2.1.6 Management of knee osteoarthritis

Knee osteoarthritis is managed with three possible strategies: pharmacological, non-pharmacological and surgical interventions such as arthroplasty.^{32,33} Pharmacological interventions may include the use of medications such as acetaminophen, oral non-steroidal anti-inflammatory drugs (NSAIDs), topical NSAIDs or corticosteroid injections to mitigate pain.³² Non-pharmacological interventions, which are neither medications nor surgery, may include exercise therapy,^{32,34} exercise therapy combined with manual therapy,^{34,35} range of motion exercises,³⁶ stretches,³⁶ education,³³ electrotherapy,^{32,33} advice regarding weight-loss,^{32,36} biomechanical devices such as gait aids,³³ knee braces or insoles,³⁷ thermotherapy,³⁶ and acupuncture.^{33,36} The surgical intervention includes unicondylar joint replacement³⁸ or total joint replacement.³⁹

2.2 Clinical practice guidelines

2.2.1 What are clinical practice guidelines?

According to Field & Lohr, “practice guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical

circumstances.”⁴⁰ The recommendations that form the basis of practice guidelines support the use of appropriate care and dissuade against the use of inappropriate care.⁴⁰ Clinical practice guidelines (CPGs) may have an impact on patients, clinicians and the broader healthcare system.⁴¹ For patients, CPGs may improve the quality of healthcare, patient specific outcomes, the consistency of care and provide education to patients so they can make informed health decisions.⁴¹ They may enhance decision making; provide clear and concise recommendations on how to proceed with treatment; eradicate outdated beliefs and attitudes about care; call attention to ineffective, wasteful and dangerous healthcare interventions;⁴¹ be used as self-assessment of individual practice;⁴² close the gap between research and clinical practice by facilitating knowledge translation^{41,43} and present research findings in a concise and digestible format.⁴⁴ Adherence to CPGs may influence the economic costs associated with healthcare by reducing hospitalizations, minimizing inappropriate pharmacological prescription and limiting unnecessary surgery.⁴¹ Field & Lohr⁴⁰ argued that practice guidelines should be developed based on scientific evidence and a consensus sentiment. This is reiterated by Scalzitti who stated, “a guideline can only be as good as the evidence on which it is based.”⁴⁵

2.2.2 How are clinical practice guidelines developed?

According to Shekelle, Woolf, Eccles, & Grimshaw⁴⁶ there are three basic principles to consider when developing CPGs: 1) ensure a sufficient number of people and financial resources are allocated to the development process, 2) a systematic review should be conducted to gather all applicable evidence to inform the guideline recommendations and 3) there must be multidisciplinary representation within the group developing the guideline. Furthermore, Scalzitti⁴⁵ suggests that explicit statements that thoroughly explain the process of creating the recommendations are required and in the absence of this detailed description, the validity of the

guidelines should be questioned. Shekelle et al⁴⁶ have outlined five specific steps to be taken when developing CPGs to ensure that patient specific clinical outcomes may be maximized when implementing the guidelines.

Step one: Identifying and refining the subject area. The topic may be related to a condition or a procedure. The topic chosen may be influenced by morbidity and mortality rates of a population, the economic impact of healthcare condition or procedure, or because there is a need to clarify the appropriateness of processes of care and evidence supporting care to maximize patient outcomes. Once a specific topic has been decided upon, the subject area or clinical condition needs to be clearly identified, defined and clarified. This is accomplished by holding conversations between patients, clinicians, guideline evaluators, stakeholders and potential users of the guidelines.⁴⁶

Step two: Running guideline development groups. It is important to form guideline development groups to oversee aspects of the guideline development process. For instance, a project management group will ensure the day to day tasks of guideline development run smoothly. It is imperative that these groups include multidisciplinary representation from stakeholders whose activities will be influenced by the development of the guidelines. These individuals on the groups will undertake specific aspects of the guideline development and roles should be clarified to ensure an efficient process.⁴⁶

Step three: Identifying and assessing the evidence. The research question for the topic needs to be established because this will assist in determining the inclusion and exclusion criteria for the evidence. Once the inclusion/ exclusion criteria have been explicitly detailed, a systematic review should be completed with the objectives of collecting all relevant evidence, assessing the applicability of the evidence to the topic area, examining the methodology and bias

of the evidence, extracting and summarizing the findings, and lastly categorizing the evidence based on its susceptibility to bias.⁴⁶

Step four: Translating evidence into a clinical practice guideline. Members of the development group will interpret the evidence and using their opinion, translate it into recommendations that consider the benefits, limitations, population for whom the recommendation is for, costs, skills, training and equipment associated with the interventions recommended. As Shekelle et al⁴⁶ argue, this component of the guideline development process needs to be explicit and transparent. As well, the members provide a “strength of recommendation” classification to the practice statements so that users can be confident that following the recommendations will produce the desired clinical outcomes.⁴⁶

Step five: Reviewing and updating the guideline. The final steps prior to dissemination of the guidelines should include an external peer review by experts familiar with the clinical content, individuals familiar with conducting systematic reviews, individuals with experience developing guidelines and by potential users of the guideline to ensure validity, clarity and applicability of the guidelines. While Shekelle et al⁴⁶ indicate that the guideline can be updated as new evidence related to the guideline emerges, they recommend designating a specific date for updating the systematic review. Once the systematic review that informs the guideline has been conducted, the guideline can be updated as appropriate.⁴⁶

2.2.3 How is the quality of clinical practice guidelines assessed?

Clinical practice guidelines should be scientifically valid, reliable, trustworthy and usable.⁴⁷ Recognizing that the quality in which CPGs were being developed was inconsistent, Brouwers et al⁴⁷ developed an outcome instrument to address these concerns. The Appraisal of Guidelines for Research and Evaluation (AGREE) was designed to assess the rigour of

methodological development, transparency of CPG development and assess the quality of CPGs.⁴⁷ The AGREE tool had 23 items categorized into six domains that assessed guideline quality which were measured on a 4-point Likert scale.⁴⁷ Consistent with the specific steps Shekelle et al⁴⁶ outlined for developing CPGs, the six domains assessed with the AGREE tool were scope and purpose, stakeholder involvement, rigour of development, clarity of presentation, applicability and editorial independence.⁴⁷ Research conducted by Brouwers et al⁴⁷ demonstrated that the AGREE tool was a reliable, useful, easy to administer and cost-effective instrument that could be used by clinicians, researchers, guideline developers and policy makers in a variety of cultural settings. However, this study did not demonstrate the validity of the AGREE tool.⁴⁷ As such, steps were taken to improve the validity of the AGREE tool.⁴⁸

To begin with, the 4-point Likert scale was replaced with a 7-point scale.⁴⁸ The performance of the 7-point scale was tested along with an analysis of its measurement properties.⁴⁸ Secondly, research was conducted to determine if guidelines that were rated higher quality with the AGREE tool were endorsed or used more frequently than guidelines rated lower quality.⁴⁹ Furthermore, the original training manual and user guide were both updated and researchers examined if these updates assisted users in differentiating between the quality of guidelines.⁴⁹ Lastly, AGREE tool was renamed the AGREE II.⁴⁹ The most current version of the AGREE II instrument has been shown to be a valid and reliable outcome tool that still includes the original 23 items categorized into the same six quality domains (see Appendix 1) that are rated using a 7-point Likert scale to assess the methodological rigour of development, transparency of development, and quality of CPGs.⁴⁹ In addition, reviewers using the AGREE II provide an overall guideline assessment and a recommendation on whether to use the guideline in clinical practice.⁴⁹

2.3 Clinical practice guidelines for managing knee osteoarthritis

2.3.1 Characteristics of existing clinical practice guidelines

Numerous guidelines for the management of lower limb OA have been developed to assist healthcare professionals, individuals with OA, governments and policy makers to make the best clinical decisions for treating lower limb OA.^{32–37,50–66} These guidelines may explicitly discuss recommendations for non-pharmacological, pharmacological or surgical interventions; or any combination of these. Furthermore, these guidelines may consist of recommendations explicitly for the knee and/or the hip or another joint in the body. For instance, one guideline describes non-pharmacological, pharmacological and surgical interventions for the hand, hip and knee.⁶¹

2.3.2 Previous quality appraisals of clinical practice guidelines for managing knee osteoarthritis

Brosseau et al⁴³ and Nelson et al⁶⁷ recently used the AGREE II tool to assess the quality of CPGs that included non-pharmacological and pharmacological recommendations for hand, hip and knee OA. Brosseau et al⁴³ found 17 CPGs to appraise but two of the guidelines focused on hand OA only. Similarly, Nelson et al⁶⁷ discovered 16 CPGs, one of which focused on hand OA only, two which highlighted pharmacological management only and one that discussed the practice guidelines for the use of orthotics. Both studies indicated that domain 1 (scope and purpose) and domain 3 (rigour of development) tended to demonstrate the highest quality scores, whereas domain 5 (applicability) and domain 6 (editorial independence), had the lowest quality scores.^{43,67} Furthermore, Brosseau et al⁴³ discovered that domain 4 (clarity of presentation) exhibited high quality scores as well. Of the 15 guidelines for lower limb OA that Brosseau et al⁴³ appraised which included non-pharmacological interventions for knee OA, they determined

10 were of high quality. These guidelines scored >60% in at least four of the six domains, with domain 3 (rigour of development) being one of those domains.⁴³ The ten high quality guidelines included those developed by the American Academy of Orthopedic Surgeons (AAOS),⁶⁶ American College of Rheumatology (ACR),³³ The National Institute for Health and Clinical Excellence (NICE),³² Osteoarthritis Research International Society (OARSI),³⁷ Ottawa Panel,^{34,50-52} Philadelphia Panel⁶⁵ and The Royal Australian College of General Practitioners (RACGP).³⁶ Since the articles by Brosseau et al⁴³ and Nelson et al⁶⁷ have been published, guidelines developed by NICE,⁵³ OARSI,⁵⁴ the Turkish League Against Rheumatism (TLAR)⁵⁵ and the RACGP⁵⁶ have been updated. Furthermore, new CPGs have been developed by the European League Against Rheumatism (EULAR),⁵⁷ the Ottawa Panel,⁵⁸⁻⁶⁰ Pan- American League of Associations for Rheumatology (PANLAR)⁶¹ and Veterans Affairs/ Department of Defense of The United States of America (VA/DoD).⁶²

2.3.3 Non-pharmacological recommendations for knee osteoarthritis

The CPGs that include recommendations for non-pharmacological interventions for individuals with knee OA suggest that the following be encouraged before medications or surgery: individualized treatments that promote self-management, education, aerobic exercise, local strengthening exercises and weight loss.^{33,53,54,56,62-64} Many of these guidelines categorize education, exercise and weight-loss as core interventions, meaning they are the standard components of non-pharmacological treatment for people with knee OA. They should be offered to everyone diagnosed with knee OA, when appropriate. Additional non-pharmacological interventions may include biomechanical devices such as knee braces,⁵⁴ gait aids,^{33,54,64} orthoses,⁵⁴ insoles³⁷ comfortable footwear,⁶⁴ electrotherapy,⁵³ thermotherapy,⁵³ hydrotherapy,⁶¹ manual therapy,^{33-35,63} range of motion exercises and stretches,^{61,62} acupuncture,³³ aquatic

physical therapy when land-based exercise not appropriate,^{55,62} yoga and tai chi⁵⁸ and patellar taping.^{33,35}

2.4 Are physiotherapists following clinical practice guidelines when treating individuals with knee osteoarthritis?

2.4.1 Theoretical rationale

Kerlinger⁶⁸ described theory as a set of concepts, definitions and propositions that are mutually and reciprocally connected to each other and which present an organized view for observing occurrences and relationships among variables. According to Creswell,⁶⁹ a theory may exist in research as an argument, discussion, figure or a rationale. Conceptually, Creswell⁶⁹ likens theory to a rainbow in that it bridges two opposing concepts, the independent and dependent variables. The rainbow ties the independent and dependent variables to each other and provides an overarching explanation on how and why the independent variable predicts and explains the dependent variable.⁶⁹ Not only does theory explain^{68,69} and predict^{68,69} a phenomena; relationship; behavior and change in behavior;⁷⁰ it also describes⁶⁹ them. According to Nilsen,⁷⁰ a good theory should provide a clear and concise explanation why a particular relationship among variables results in a specific outcome.

McKenna⁷¹ argues that when theory is used to inform research, it will act as a guide to conducting the research and it will frame the research question(s) and investigation; provide the study with a clear and concise focus; assist in developing the parameters for the study, interventions and data collection procedures; provide a perspective for interpreting the data; increase the generalizability of the findings; and discuss the results in a meaningful way.⁷¹ Not only can theory act as a road map to conducting research, Eccles et al⁷² argue that using theory to guide research can help to explain why some interventions to promote the uptake of knowledge

are more effective than other interventions. Research conducted by Bérubé et al⁷³ has demonstrated that professional and organizational interventions influenced and guided by implementation strategies grounded in theory will enhance guideline awareness and knowledge in physiotherapists. Furthermore, Eccles et al⁷² suggest that theory can be used to understand the different determinants that influence healthcare practitioner behavior and adoption of best practice or CPGs. Research by Evans et al⁷⁴ and Beeckman et al⁷⁵ supports this suggestion brought forth by Eccles et al.⁷² Both groups of researchers showed that utilizing a theory based approach and implementation models in the delivery of interventions to improve asthma care and pressure ulcer care, improved the use of and adherence to CPGs by healthcare practitioners.^{74,75}

Despite arguing that researchers should use theory to inform and guide their studies, McKenna⁷¹ cautions that embarking on research that is theory framed with an inflexible ideology may inhibit the research process. If a researcher possesses concrete ideas and an unwillingness to maintain an open mind while planning, conducting, analyzing and interpreting the results, the study may be subject to bias.⁷¹ As well, having an unyielding attitude towards a theory to guide research may result in innovative explanations of circumstances, occurrences and behavior being discounted, ignored or dismissed.⁷¹

2.4.2 Knowledge-to-Action Framework

The Knowledge-to-action (KTA) framework⁷⁶ is a process model that provides practical guidance on developing strategies to translate research findings into clinical practice.⁷⁰ As well, the KTA framework describes factors that are thought to influence how knowledge is acquired, translated and utilized.⁷⁷ Graham et al⁷⁶ have developed a conceptual map that divides the KTA process into two separate, yet intricately interwoven concepts. These two concepts entitled

“Knowledge Creation” and the “Action cycle” are comprised of phases that embody the knowledge to action process⁷⁶ (see Appendix 2). While the KTA framework elucidates concrete phases in both the knowledge creation and action cycle, Graham et al⁷⁶ argue that the process model is not necessarily a linear one, especially during the action cycle. Phases within the framework may occur sequentially or non-sequentially, simultaneously and one phase of the process model maybe the primary focus of a knowledge translation strategy or research project.

Graham et al⁷⁶ state that knowledge creation is a series of phases in which knowledge becomes more refined and useful for clinicians, policy makers, patients and other stakeholders. This component of the KTA process typically begins with the search for all relevant first-generation research specific to a health condition. Once this knowledge has been found, it is appraised and synthesized by formal processes such as a systematic review, to bring clarity to the potentially massive volume of knowledge. Lastly, the knowledge is used to develop tools or products, like CPGs, that present knowledge in a format that is clear, comprehensible and user-friendly. Ultimately the aims of these tools are to assist with the uptake and utilization of the knowledge.

The action cycle commences with the goal of implementing knowledge into clinical practice.⁷⁶ As Graham et al⁷⁶ explain, the action cycle is a dynamic and complex process, that may not progress in a straight line. The action cycle is composed of seven phases which begins with the identification of a problem that needs addressing and seeking out knowledge that may address this problem. Likewise, this phase may involve an individual becoming aware of knowledge tools or products that have been developed and establishing if a knowledge-practice gap exists.⁷⁶ In the context of this study, the principal researcher became aware of non-pharmacological CPGs for individuals with knee OA and was curious to know to what extent

these guidelines were being followed by physiotherapists in Canada. As such, the principal researcher decided to develop a study that would aim to determine if a practice gap exists between how physiotherapists in Canada are treating people with knee OA and what the non-pharmacological recommendations from CPGs for individuals with knee OA suggest.

Graham et al⁷⁶ acknowledge the importance of a phase to assess the barriers to implementation so strategies to minimize these barriers can be established. Similarly, facilitators of knowledge implementation need to be identified so they can be maximized during the action cycle. While the conceptual KTA process model depicts this phase immediately following adapting the knowledge to the local context,⁷⁶ the principal researcher decided for our study the assessment of barriers and facilitators would precede adapting the knowledge to the local context. The principal researcher chose this pathway because adapting knowledge to the local context is a process that involves decisions about the value, usefulness and appropriateness of knowledge in a specific setting.⁷⁶ By completing the barrier and facilitator assessment prior to adapting the knowledge, a deeper understanding about current physiotherapy clinical practice; beliefs about CPGs; confidence about obtaining, assessing and interpreting CPGs; environmental factors that may influence utilizing CPGs and consequences of utilizing CPGs will be determined. The information gathered via the barrier and facilitator assessment, can be utilized to decide if there is need, value and usefulness in adapting the CPGs to the local context. If the information suggests it is appropriate, the knowledge can be customized and tailored to specific situations and circumstances.⁷⁶

Once the barriers and facilitators to knowledge uptake have been assessed and the knowledge adapted to a local context, the selection, tailoring and implementation of interventions to promote knowledge translation may commence.⁷⁶ While the inventions that

promote the dissemination and uptake of knowledge are being or have been carried out, the KTA process should include the means to monitor the use of knowledge to determine how and the extent to which it has been disseminated to the user groups. Furthermore, as the knowledge is being utilized, it is necessary to determine the impact of its use. Evaluating patient, clinical and health-care outcomes will allow those implementing the knowledge translation interventions to determine if the efforts to promote the uptake of knowledge was successful.⁷⁶

Lastly, how and if knowledge use is being sustained should be assessed. Graham et al⁷⁶ theorize that the barriers and facilitators of maintaining knowledge use, may differ from those which influence the uptake of knowledge. As such, it is important to determine what the barriers and facilitators to sustaining knowledge use may be, so interventions can be designed to ensure long-term knowledge use in clinical practice is feasible.⁷⁶

The KTA cycle developed by Graham et al⁷⁶ was selected as a guiding framework for this study because it has been used in previous studies that have researched the beliefs, attitudes, knowledge and behaviors of physiotherapists, as they related to evidence-based practice and the use of CPGs.^{44,78} In our study, the KTA framework was used as a process model to guide us in determining factors within the implementation process that may affect the uptake and utilization of CPGs by physiotherapists in clinical practice. We used the KTA framework to inform some of the demographic questions such level of education attained, the type of employment setting, the province or territory licensed to practice and whether the respondent was employed in an urban or rural setting (Appendix 3). These questions relate to environmental factors which may impact CPG implementation. The KTA framework also informed questions pertaining to clinical practice such as the types of non-pharmacological interventions and education provided to an individual with knee OA (Appendix 3). These questions provide insight to whether CPGs are

being utilized in practice. Furthermore, the KTA framework was used to establish questions about whether respondents believed CPGs for knee OA existed, whether they believed there were barriers and facilitators to CPG use and what those barriers and facilitators were (Appendix 3). These questions provide information on additional factors that may impact CPG uptake. While we used the KTA framework as a process model to identify the factors that may have related to the implementation of CPGs, it is not an explanatory model. It cannot be used to explain why physiotherapists adhered or did not adhere to CPGs. As well, it cannot explain why physiotherapists provided the non-pharmacological interventions or education they did when treating an individual with knee OA.

2.4.3 Social Cognitive Theory

The social cognitive theory is a model for behavior that was developed by Bandura⁷⁹ which states that behavior is influenced by the reciprocal and dynamic interaction of three determinants: cognitive and personal characteristics, such as self-efficacy; environmental factors; and behavior. Self-efficacy is the belief in one's ability to master a challenging demand and successfully execute a behavior necessary to produce a specific outcome.⁸⁰ Mastery of a specific behavior and successfully producing a desired outcome, reciprocally influences self-efficacy and enhances an individual's belief in her ability to execute a behavior.⁸⁰ The influence of cognitions, environmental factors and behavior may vary for different activities and for individual circumstances.⁷⁹ As well, the strength of the influence of each determinant and the timing of the determinant's influence may demonstrate significant variability.⁷⁹ For instance, time constraints (environmental factor) in the physiotherapy private practice sector may strongly influence the ability of a physiotherapist to deliver non-pharmacological interventions for knee OA even

though the physiotherapist has a strong belief in her ability (self-efficacy) to deliver such interventions and has successfully executed that behavior previously.

The SCT theorizes that knowledge acquisition, learning and personal development occur within a social context.⁷⁹ Bandura suggests that knowledge is acquired through the observational learning of behaviors and by witnessing the consequences of these observed behaviors.⁷⁹ By watching the behaviors of a social model, like a physiotherapy colleague interacting with a patient, an individual develops a cognitive map or guide on how to behave in similar circumstances without needing to rely on trial and error.⁷⁹ This guide can be used to influence subsequent behavior when a comparable situation arises.⁷⁹ Furthermore, while observing a social role model, an individual sees the consequences of the social models behavior.⁸¹ These consequences can be either positive or negative and contribute to the observer developing beliefs about the consequences of her own actions or behavior.⁸¹ These beliefs are known as outcome expectancies and together with perceived self-efficacy, influence behavior and behavior change.⁸¹ After developing a cognitive map, outcome expectancies, and depending on perceived self-efficacy, an individual who observed the behavior, may replicate it in future situations.

For example, a student physiotherapist observes her preceptor providing individualized, patient-centered education and local strengthening exercises for a patient with knee OA. The patient is receptive to the education provided and feels reassured that OA is not a debilitating condition. The patient is happy leaving the physiotherapy appointment. In two weeks, the patient returns to physiotherapy to discuss the home exercises with the preceptor and student physiotherapist. The patient reports that while the knee pain persists, the exercises have improved the mobility of the knee. Because the student physiotherapist has observed this interaction between the patient and preceptor, she has developed a cognitive map and outcome

expectancies of how future interactions in a similar setting may occur. Together with her keen sense of perceived self-efficacy, the student will feel more confident in her ability to deliver the interventions necessary to treat an individual with knee OA.

While Bandura⁷⁹ acknowledged the importance of vicarious observation in the role of knowledge acquisition, he was not dismissive of the influence that media has on learning. Bandura explains that through the observation of thought patterns, values, attitudes and styles of behavior on television, learning may occur via media. With the development and advancement of social media platforms such as Facebook, Twitter, YouTube and Instagram, it would be imprudent to dismiss their role in the acquirement of knowledge. Social media can be used to observe how physiotherapy colleagues demonstrate patient-centered care, prescribe exercises for individuals with OA, and promote self-management strategies for adherence to exercise.

The social cognitive theory (SCT)⁷⁹ was chosen to inform this study because it is an explanatory model that can function to explain and help us understand why physiotherapists followed CPGs or not, and whether they provided treatment consistent with CPGs. Furthermore, this theory can broaden our understanding of how physiotherapists acquired the knowledge to treat individuals with knee OA. To help us explain and understand the behavior of the respondents in our survey, the SCT⁷⁹ informed specific questions that were included in the survey (Appendix 3). We asked questions associated with cognition/knowledge, personal characteristics of the respondents, environmental factors, and behavior, all components of the SCT which Bandura⁷⁹ has stated influence behavior. For example, our survey included questions about level of education, post-graduate courses related to knee OA and awareness of CPGs for knee OA, which are all aspects of cognition/ knowledge. We asked respondents their gender and age, which are aspects of personal characteristics. We asked questions pertaining to self-efficacy

i.e., confidence in finding, appraising and interpreting CPGs; and environment i.e., province of employment, setting of employment, rural vs urban employment location. As well, the SCT informed questions specific to outcome expectancies which together with self-efficacy, influence behavior. Questions regarding outcome expectancies asked respondents whether they believed CPGs improved patient care, improved patient outcomes and enhanced clinical decision making. It is important to acknowledge that both the SCT⁷⁹ and the KTA framework⁷⁶ jointly influenced the development of the questions for the survey specific to cognition/knowledge, the environment of employment and the behavior of physiotherapists in terms of the types of interventions they offered to people with knee OA.

Lastly, the SCT⁷⁹ has underpinned research conducted by both Jette et al⁷⁸ and Bernhardsson et al⁴⁴ as they have sought to understand and explain why physiotherapists do or do not follow evidence-based practice and CPGs. The SCT has been used in physiotherapy research aimed at enhancing the use of evidence-based research in the clinical practice of physiotherapists.⁸² The study conducted by Tilson et al,⁸² showed that the SCT could be used to develop an educational program designed to promote the integration of evidence-based research into clinical decision making. Their research found that there was a significant increase in the self-efficacy of physiotherapists in searching for evidence, which resulted in increased confidence and use of evidence-based research in their clinical practice.⁸²

2.4.4 Current state of physiotherapy practice for individuals with knee osteoarthritis

It appears gaps between the literature for non-pharmacological interventions for individuals with knee OA and physiotherapy practice exist.⁸³⁻⁸⁸ Physiotherapists tend to provide individualized treatment,⁸⁸ education,^{83-86,88,89} exercise^{84,85,88,90} and promote self-management strategies.^{83,86,88} Of these interventions, exercise therapy is most consistently utilized by

physiotherapists.^{83–89,91} Muscle strengthening^{83,85,86,88,89} is frequently prescribed, whereas aerobic exercise^{83,85,86} is not promoted by physiotherapists as often, despite it being recommended by numerous guidelines.^{11,50,54,63,64,92} In fact, only 9% of surveyed UK physiotherapists would recommend a formal aerobic training program.⁸³ Similarly, education on the importance of weight-loss is not frequently discussed between physiotherapists and patients who have knee OA, with less than 60% of physiotherapists reporting having these conversations with patients.^{85,86,88}

Other non-pharmacological interventions utilized by physiotherapists include acupuncture,^{85,86} TENS,^{83,85–87} laser,^{86,88} thermotherapy,^{83,85,88} IFC,^{87,88} NMES,⁸⁸ manual therapy,^{83–85,87} massage therapy,^{85,87,88} hydrotherapy,^{85,87} braces,⁸⁴ taping,^{87,88} wedge insoles,⁸⁴ myofascial release⁸⁵ and ultrasound.^{84,87,88} Despite the widespread use of these additional interventions for individuals who have knee OA, the current guidelines do not consider them standard treatments for all individuals who have knee OA.^{30–34,44–48,50} Instead, these interventions are considered adjunct treatment, and should be used on an individual basis and in consultation with the patient.^{36,54,63,92}

2.4.5 Assessing the extent to which physiotherapists adhere to non-pharmacological CPGs

Outcome measures which assess the knowledge and clinical practice of healthcare providers are necessary to identify deficiencies in the process of healthcare and improve overall quality of care.⁹³ Clinical vignettes are structured healthcare scenarios and are useful assessment tools to achieve these aims, but they must be validated to ensure they are measuring what they are intended to.⁹³ Research has demonstrated that clinical vignettes are a valid and useful outcome measure to assess the clinical practice of groups of healthcare providers including physicians^{93,94} and physiotherapists.⁹⁵ They can be utilized to identify gaps in clinical knowledge

and they have been shown to be manageable and inexpensive to administer.⁹³⁻⁹⁵ Lastly, the validity of clinical vignettes has endured even when administered by pen and paper or computerized versions; across multiple health conditions such as diabetes, depression, low back pain, chronic obstructive lung disease, coronary artery disease and vascular disease; within a variety of healthcare settings and amongst varying levels of healthcare provider experience.⁹³⁻⁹⁵

3 Rationale for the study

The non-pharmacological recommendations from CPGs for individuals with knee OA that have been shown to improve pain, physical function and quality of life include exercise therapy,^{34,96} weight loss⁹⁷ and self-management strategies.^{98,99} Despite research indicating that physiotherapists tend to favor promoting self-management strategies and exercise therapy when treating individuals who have knee OA, very few of the CPGs specifically recommend referring individuals with knee OA to a physiotherapist for assessment and treatment.^{33,35,36,62} In Canada, physiotherapists are primary care health providers with expertise in the assessment and treatment of musculoskeletal conditions.¹⁰⁰ Physiotherapists are well-placed in the healthcare system to deliver some aspects of the non-pharmacological interventions such as education and exercise. Prior to physiotherapists advocating more vocally to the public about their role in helping individuals with knee OA live well, research should be conducted to establish the clinical practice of physiotherapists who work in Canada specific to knee OA. To date, there is no research describing the self-reported clinical practice of physiotherapists who treat individuals with knee OA in Canada, specifically the extent to which they follow CPGs. Furthermore, several CPGs that include non-pharmacological interventions for individuals with knee OA have been updated or newly developed since 2014.

4 Purpose of the study

The purposes of this research project were to critically appraise updated or newly developed CPGs for individuals with knee OA and to summarize the non-pharmacological treatment recommendations from these CPGs. Second, we established the self-reported clinical practice of physiotherapists who treat people with knee OA in Canada and investigated beliefs, confidence, barriers and facilitators specific to CPGs. Lastly, we compared the clinical practice of physiotherapists to the highest quality CPGs to determine if the care they provided is consistent with the recommendations in the CPGs.

5 Objectives of the study

- 1) To assess the overall quality of recently updated or newly developed CPGs for knee OA with the Appraisal of Guidelines for Research and Evaluation II (AGREE II)¹⁰¹ tool, establish high quality CPGs, determine the reliability of the AGREE II tool between the evaluators, summarize the non-pharmacological recommendations from the newly appraised CPGs and recommend the best practice guidelines for physiotherapists to follow.
- 2) To establish the clinical practice of physiotherapists practicing in Canada and treating people with knee OA via a three-part electronic survey that includes 1) questions to capture demographic data of licensed physiotherapists working in Canada, 2) a clinical vignette to ascertain the types of non-pharmacological interventions offered to individuals who have knee OA, and 3) questions about beliefs, confidence, barriers and facilitators specific to using CPGs for people with knee OA.
- 3) To compare differences in the self-reported practice between physiotherapists who follow CPGs and those who do not follow CPGs, determine the predictor variables

which influence if physiotherapists follow CPGs and determine the extent to which physiotherapists provide care consistent with the highest quality CPGs when treating individuals who have knee OA.

6 Hypotheses

- 1) Like previously developed CPGs, we hypothesized recently updated or newly developed CPGs would recommend individualized, patient-centered care with a focus on self-management that emphasizes aerobic exercise, muscle strengthening and weight-loss. Likewise, the newly appraised CPGs would effectively address domain 1 (scope and purpose), domain 3 (rigour of development) and domain 4 (clarity of presentation). Furthermore, these CPGs would not effectively address domain 2 (stakeholder involvement), domain 5 (applicability) and domain 6 (editorial independence). The overall guideline scores would be high and most of the newly developed or updated CPGs will be recommended for use by physiotherapists in clinical practice when treating individuals with knee OA.
- 2) Most physiotherapists in Canada would be practicing for more than 10 years, report they do not follow CPGs for knee OA and would not have not taken post-graduate course related to OA.
- 3) We would find statistically significant differences in the core interventions and most of the adjunct interventions between physiotherapists who reported they followed and did not follow CPGs for people with knee OA.
- 4) Most physiotherapists in Canada would provide certain aspects of the core non-pharmacological interventions for individuals who have knee OA such as education and local strengthening exercises. As well, most physiotherapists practicing would

indicate they continue to use interventions not as strongly recommended such as manual therapy, TENS/ IFC, acupuncture and ultrasound.

7 Methods

7.1 Critical appraisal of clinical practice guidelines

7.1.1 Study design

The first component of this study involved licensed physiotherapists who were trained evaluators in using the Appraisal of Guidelines for Research and Evaluation II (AGREE II)¹⁰¹ to assess relevant CPGs.

7.1.2 Ethical considerations

Ethics approval was not required for the critical appraisal.

7.1.3 Literature search

A systematic, electronic literature search of PubMed, OVID, CINAHL, Scopus, Sport Discus, PEDro and the National Guideline Clearinghouse was conducted using the following key terms: care-maps, knee osteoarthritis, knee osteo-arthritis, non-pharmacological/ non-surgical clinical practice guidelines, pathways, physiotherapy and recommendations. A research librarian was consulted to ensure comprehensiveness of the search terms.

7.1.4 Eligibility criteria

Clinical practice guidelines were included in the study if they met the following criteria: were published between January 2014- January 2019, consisted of a non-pharmacological component for adults (age ≥ 18 years old) with knee OA, were written in the English language and used a grading system to evaluate the evidence which informed the recommendations.

Clinical practice guidelines were excluded if they were published before 2014, were written in a language other than English, were specific to other types of arthritis such as rheumatoid arthritis or gout, included other joints such as the spine, shoulder, elbow, hip or hand with no mention of knee OA in the guideline and if surgical or pharmacological interventions were the sole focus of the guideline.

7.1.5 Data collection

7.1.5.1 AGREE II

The AGREE II¹⁰¹ was chosen to appraise the quality of recently developed or updated CPGs because it has been shown to be a reliable⁴⁷ and valid tool⁴⁹ when tested by many different end users and with many types of guidelines. Secondly, it has been utilized in previously conducted CPG quality appraisals by Brosseau et al⁴³ and Nelson et al.⁶⁷ Lastly, because the appraisals were conducted via a secure online platform, it made the assessment process an efficient and user-friendly method for guideline appraising. The online method provided an environmentally conscious approach to evaluating the guidelines and raters were provided with information that aimed to help them accurately score an item individually. As well, item scores were automatically summed and a domain score in percentage was given. Furthermore, summary reports of individual and combined evaluator results were available, and the results and comments from the evaluators were merged into a portable document format (PDF) or excel spread-sheet which was used for analysis.

All evaluators were licensed physiotherapists. They each read the updated version of the AGREE II user manual (<https://www.agreetrust.org/wp-content/uploads/2017/12/AGREE-II-Users-Manual-and-23-item-Instrument-2009-Update-2017.pdf>), completed the online tutorial training <http://agree2.machealth.ca/players/open/index.html> and completed the tutorial practice

exercise <http://agree2.machealth.ca/openinstrumentfeedback.aspx?id=918e38c1-a84d-45aa-8343-145c06eea243>. Two pairs of evaluators independently assessed all the eligible CPGs using the electronic AGREE II instrument <https://www.agreetrust.org/login/>.

7.1.6 Data analysis

After the CPGs were independently assessed, a quality domain score for each of the six AGREE II¹⁰¹ domains was established based on the evaluators item scores. The quality domain scores were calculated by the AGREE II instrument by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain.¹⁰¹ For example, if two appraisers gave the following scores for the three items in domain 1 (scope and purpose) then the following score sheet (and resultant scores) would be generated:

	ITEM 1	ITEM 2	ITEM 3	TOTAL
Appraiser 1	5	6	6	17
Appraiser 2	6	6	7	19
TOTAL	11	12	13	36

Maximum possible score = 7 (strongly agree) x 3 (ITEMS) x 2 (appraisers)= 42

Minimum possible score = 1(strongly disagree) x 3 (ITEMS) x 2 (appraisers)= 6

Total scaled domain 1 score will be:

$$\frac{\text{Obtained score} - \text{minimum possible score}}{\text{Maximum possible score} - \text{minimum possible score}} = \frac{36 - 6}{42 - 6} = \frac{30}{36} = 0.833 \times 100 = 83\%$$

If an item score showed a difference of ≥ 2 points between the evaluators, the item was discussed. After the discussion, each evaluator had the opportunity to rescore the item and the new score was recorded. The quality domain scores were recalculated manually if any individual items within the domain were adjusted. In addition to the quality domain scores, the mean domain scores and standard deviations were calculated using an online calculator.¹⁰²

In addition to establishing quality domain scores and domain mean scores, each evaluator used the AGREE II instrument to determine an overall guideline assessment rating on a 7-point Likert scale. As well, each evaluator decided whether to recommend the use of the guideline to physiotherapists. The AGREE II calculated the overall guideline rating based on each evaluators individual rating in the same manner as the quality domain scores.¹⁰¹

While the AGREE II instrument is used to give an overall quality score to the CPGs, no specific criteria to determine between high- and low-quality guidelines has been proposed by the AGREE II consortium. Developers of the AGREE II provide examples of benchmarks that can be used to assess the quality of the guidelines, but users of the AGREE II are encouraged to establish their own criteria for high quality guidelines based on the objectives and goals of the appraisal prior to conducting the assessment of the guideline.¹⁰¹

Brosseau et al⁴³ opted to utilize criteria from previously conducted guideline appraisals which suggested that domain scores greater than 60% are effectively addressed.^{103,104} As well, they decided they would recommend a guideline for use when at least three of the six domains were effectively addressed, and when one of these domains was domain 3 (rigour of development). In the critical appraisal conducted by Yan et al,¹⁰⁴ they too decided a domain was effectively addressed when it scored 60%. However, they considered a guideline high quality when at least four of six domains, with domain 3 being one of them, scored greater than 60%.

We decided to use the criteria established by Yan et al.¹⁰⁴ The CPGs we appraised were considered high quality only when at least four out of the six domain scores were > 60% and one of those domains must be domain 3. We opted not to follow the criteria Brosseau et al⁴³ utilized because when they analyzed their results, the high quality guidelines exceeded their criteria by effectively addressing at least four to five of the six domains. As such, in the discussion of their paper, Brosseau et al⁴³ stated high quality guidelines were those that were effectively addressed in at least four out of six domains. Furthermore, when we reviewed the literature which compared newly updated CPGs to their previous versions, we noted that most domains scored higher in the newer CPGs versus the older ones. By observing this improvement in the behavior of how the CPGs were performing, we speculated that CPGs which were newly developed or updated since 2014 would continue to demonstrate an improvement in the quality and reporting of the guidelines. It was for these above-mentioned reasons we decided on the criterion we did. We decided amongst ourselves which guidelines were the most appropriate to use to compare the current state of physiotherapy practice in Canada for individuals who have knee OA.

Lastly, the interrater agreement for each of the AGREE II domains was calculated with the raw AGREE II domain scores using intraclass correlation coefficient (ICC) based on a random analysis of variance (ANOVA) for repeated data.¹⁰⁵ This statistical analysis assessed the level of agreement and reproducibility of numerical measurements between the pairs of evaluators for each domain.¹⁰⁶ The ICC calculations were conducted using the Statistical Package for Social Sciences (SPSS) version 25.

7.2 Survey and vignette

7.2.1 Study design

The second component of this research project was a cross-sectional study consisting of a three-part electronic survey written in English only that was conducted for approximately 14 weeks. The survey gathered quantitative data related to demographics, determined the self-reported clinical practice of physiotherapists working in Canada and investigated beliefs, confidence, barriers and facilitators specific to CPGs for people with knee OA.

7.2.2 Ethical considerations

The primary investigator obtained ethics approval from University of Manitoba's Health Research Ethics Board (HREB) for the three-part electronic survey component of the study (HS2231 (H2018:400)).

7.2.3 Eligibility criteria

Participants were licensed physiotherapists in any province or territory within Canada, were currently employed in a clinical setting and provided treatment to adults (>18 years old) who had knee OA.

7.2.4 Participant recruitment and sample size

The electronic survey to gather demographic data; clinical practice information; beliefs, confidence, barriers and facilitators pertaining to CPG use of physiotherapists who work in Canada, was distributed to all physiotherapists who were members of the Canadian Physiotherapy Association (CPA). As well, the survey was shared with physiotherapists registered with the College of Physiotherapists of Manitoba (CPM), the College of Physiotherapists of British Columbia (CPTBC) and physiotherapists who were members of the

Ontario Physiotherapy Association (OPA). All three of these groups shared a link to the survey with their members. Lastly, the Physiotherapy Alberta College + Association provided the principal investigator with a list of email addresses of their members who had agreed to be contacted about research studies. The principal investigator emailed these physiotherapists inviting them to participate in the survey. All physiotherapists who were eligible to participate in the survey created a unique participant indirect identifier that the co-investigators used to ensure participants completed the survey only one time.

Based on data from the Canadian Institute for Health Information, approximately 22,000 individuals were licensed to practice physiotherapy in Canada in 2017.¹⁰⁷ Of these 22,000 individuals licensed to practice in Canada, approximately 11,500 were members of the CPA.¹⁰⁸ Because we enlisted three physiotherapy regulatory bodies to assist with recruitment, we expected our invitation to participate in our survey to reach another 2,000 licensed physiotherapists in addition to the 11,500 physiotherapists who were members of the CPA. Therefore, we expected information about our survey to be distributed to approximately 13,500 physiotherapists who worked in Canada. Previous studies that have examined the clinical practice of physiotherapists treating people with knee OA have registered responses rates varying between 3-58%.^{83,84,86,88} We were optimistic that this study would have a response rate of approximately 5-10% for a total sample size between 750-1500 physiotherapists employed in Canada.

7.2.5 Participation incentive

All physiotherapists who completed the three-part electronic survey were eligible for a chance to win one of three \$50 gift certificates.

7.2.6 Data collection

Data collection occurred over a period of 14 weeks from November 2018- February 2019. Survey Monkey (www.surveymonkey.com) was used to develop the templates for both part one (demographic data), part two (self-report of clinical practice) and part three (beliefs, confidence, barriers and facilitators to CPG use) of the electronic survey and was used to collect the survey data. Pilot testing of the electronic survey was completed by a convenience sample of six Manitoba physiotherapists prior to formal distribution to ensure readability, comprehensibility and to determine the time taken to complete the survey. Modifications to the survey were made based on feedback from the pilot testing. The survey took approximately 10 minutes to complete. (See Appendix 4 for survey and clinical vignette details.)

7.2.7 Data analysis and statistics

The dependent variable in this study was self-reported adherence to non-pharmacological CPGs for individuals with knee OA. Even though this variable was not dichotomous in the survey, we intended to categorize the participants responses as either “yes” or “no” for data analysis, depending on how they answered the question. Participants were deemed to follow non-pharmacological CPGs if they answered “always, most of the time or sometimes” to the question. If study participants answered, “rarely or never”, they were deemed not to follow the guidelines. However, many physiotherapists did not answer this question in our survey. We did not anticipate this happening, nor did we force physiotherapists to answer this question. Thus, we were left with the task of determining how to categorize the respondents who left this question blank. For statistical analysis, we decided to combine those who reported they did not follow CPGs and those who left the question blank into one group. For statistical reporting in tables, we

labelled this group as “no/no answer”. However, when we discuss this group in our results and discussion sections, we refer to them as “did not follow/did not answer”.

The independent variables related to adherence to CPGs for people with knee OA were age; gender; province/ territory employed in; employment setting; location of employment setting; number of years working as a physiotherapist; level of education; post-graduate training specific to OA; confidence in ability to find, interpret and appraise CPGs; and beliefs that CPGs improve patient care, improve patient outcomes, enhance decision making and were encouraged at work. We chose these variables because they were informed by both the SCT⁷⁹ and KTA⁷⁶ framework. Specifically, these questions pertained to personal characteristics, cognition/knowledge, self-efficacy, the environment related to employment and outcome expectancies. These are components of the SCT⁷⁹ that interact with each other and influence behavior. Furthermore, questions about cognition/knowledge, personal characteristics and the environment are factors that can be evaluated to determine why CPGs are implemented or not implemented in clinical practice.⁷⁶ Sub-categories within the following independent variables were combined when necessary to optimize data analysis: gender; level of education; province of employment and primary employment setting. Once this was completed, we proceeded with the data analysis.

Statistical Package for Social Sciences (SPSS) version 25 was used to carry out analysis of the survey data. We used descriptive statistical analysis to characterize and describe the study participants, describe the self-reported clinical practice of physiotherapists who treat people with knee OA in in Canada, and describe results specific to questions pertaining to CPGs such as if respondents were aware of CPGs, beliefs and confidence about CPGs, if respondents felt barriers and facilitators to CPG use existed and what those barriers and facilitators were. In addition, we

used SPSS 25 to analyze the amount of missing data and patterns of missing data specific to the independent variables. Based on the amount of missing data and the randomness of the missing data we opted to use simple imputation methods to replace the missing data. The method we used to replace the missing data was mode imputation.¹⁰⁹ This method replaced missing data within categorical variables based on the value that appeared the most often. We completed mode imputation methods for the following independent variables: age; gender; length practicing; highest education attained; primary employment setting; taken a post-graduate course related to knee OA; confidence in ability to find, interpret and appraise CPGs and beliefs that CPGs improve patient care, improve patient outcomes, enhance decision making and are encouraged at work. Furthermore, we completed mode imputation when determining whether respondents believed CPGs existed and whether they believed barriers and facilitators to CPG use existed.

To investigate the differences in the demographic information and independent variables between the physiotherapists who reported they followed non-pharmacological CPGs and those who reported they did not/did not answer, we conducted chi-square analysis. Furthermore, we conducted chi-square analysis to determine the differences in the types of core and adjunct interventions prescribed and the types of education discussed between the two groups of physiotherapists. Lastly, we used chi-square analysis to determine if differences existed between respondents who followed CPGs/did not follow CPGs and whether they believed barriers and facilitators to CPG use existed. We dichotomized respondents' answers to the questions about whether barriers and facilitators existed into "yes" or "no/did not know". When there was a statistically significant difference between the dependent and independent variables in the chi-

square analysis, we used Cohen's effect sizes to categorize the strength of the association.¹¹⁰ Statistical significance was set at $p < 0.05$.

We initially proposed to conduct binomial logistic regression to determine whether any of the statistically significant independent variables predicted the likelihood of a physiotherapist following non-pharmacological CPGs for individuals who have knee OA. However, after completing the chi-square analysis, we discovered there were few statistically significant differences between those who followed and those who did not follow CPGs specific to the independent variables. We discussed with a statistician the appropriateness of conducting a binomial logistic regression in this situation. We still wanted to investigate the behavior of physiotherapists when treating an individual with knee OA, but we decided that we would analyze if certain independent variables influenced the utilization of core interventions rather than following CPGs. We decided to focus on the core interventions because research has shown they have positive effects on mobility, function and quality of life in people with knee OA.⁹⁶ We wanted to ensure the statistical analysis was informed by the KTA⁷⁶ framework and SCT⁷⁹ so we opted to use independent variables related to cognition/knowledge, environment, and personal characteristics, in this analysis. We investigated if gender; age; primary employment setting; level of education; number of years practicing; province or territory licensed to practice physiotherapy in; and taken a post-graduate course related to knee OA influenced the probability of a physiotherapist prescribing any of the core interventions for people with knee OA. We decided to include whether physiotherapists followed CPGs or as a predictor variable in the analysis as well. To conduct binominal logistic regression, a large enough sample size was required in order to ensure the standard error was not over inflated.¹¹¹ We used the following formula recommended by Peduzzi¹¹¹ to ensure our sample size was large enough: $N = 10 * k/p$,

where k = number of variables and p = the smallest proportion of negative or positive cases in the population. Statistical significance was set at $p < 0.05$.

8 Results

8.1 Critical Appraisal of Clinical Practice Guidelines

8.1.1 Characteristics of appraised clinical practice guidelines

A systematic, electronic literature search of the following databases was conducted between January 2018- January 2019: PubMed, OVID, CINAHL, Scopus, Sport Discus, PEDro and the National Guideline Clearinghouse. The key search terms included: care-maps, knee osteoarthritis, knee osteo-arthritis, non-pharmacological, non-surgical, clinical practice guidelines, pathways, physiotherapy and recommendations.

Ten CPGs were included in the critical appraisal.⁵³⁻⁶² Seven guidelines were newly developed,^{54,57-62} and the remaining three were updates of pre-existing guidelines.^{53,55,56} The three Ottawa Panel CPGs developed by Brosseau et al⁵⁸⁻⁶⁰ and the CPGs developed by OARSI,⁵⁴ TLAR⁵⁵ and NICE⁵³ focused on knee OA only, whereas those developed by the RACGP⁵⁶ and VA/ DoD⁶² included recommendations for individuals with either hip or knee OA. The guideline developed by EULAR⁵⁷ was intended for individuals with rheumatoid arthritis, spondyloarthritis, hip and/or knee OA. The remaining CPG by PANLAR⁶¹ included practice recommendations for individuals with hip, knee or hand OA.

Non-pharmacological recommendations that explicitly discussed physical activity recommendations were the exclusive focus of four CPGs.⁵⁷⁻⁶⁰ Specifically, the first Ottawa Panel CPG focused on mind-body exercise,⁵⁸ the second Ottawa Panel CPG focused on strength exercise⁵⁹ and the third Ottawa Panel CPG focused on aerobic exercise only.⁶⁰ The CPG

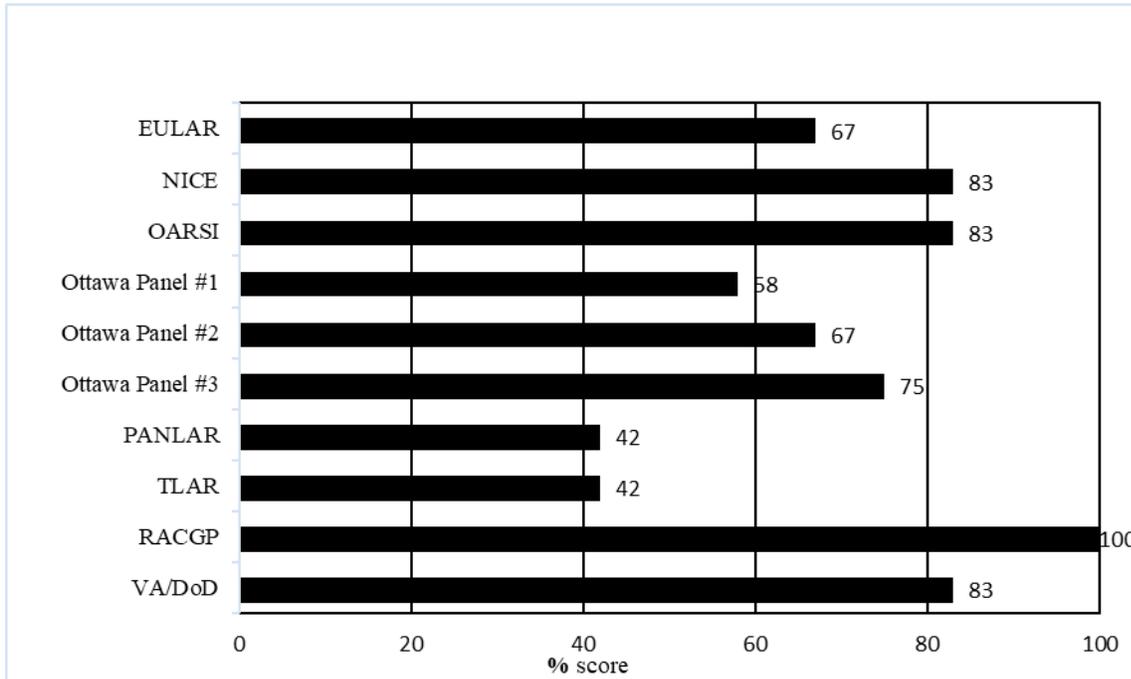
developed by EULAR⁵⁷ included general physical activity recommendations. The OARSI⁵⁴ CPG included both non-pharmacological and pharmacological recommendations and the remaining five CPGs by NICE,⁵³ PANLAR,⁶¹ TLAR⁵⁵, the RACGP⁵⁶ and the VA/DoD⁶² included pharmacological, non-pharmacological and surgical recommendations.

8.1.2 AGREE II results

8.1.2.1 Overall quality of the appraised CPGs and recommendations for use

We used the AGREE II instrument to determine the overall quality scores of the 10 included CPGs and to provide a recommendation on whether to use the appraised CPGs. The results of the overall quality scores can be found in Figure 1. Overall quality scores ranged between 42% and 100%, with the CPG developed by the RACGP⁵⁶ scoring the highest and the CPG developed by PANLAR⁶¹ scoring the lowest. The evaluators recommended all guidelines for use except for two. Neither evaluator recommended the guideline developed by TLAR⁵⁵ for use. The evaluators of the PANLAR⁶¹ differed in their recommendation, one evaluator recommended this guideline for use with modifications, and the other evaluator did not recommend it.

Figure 1. Overall Quality Scores of Appraised Clinical Practice Guidelines



EULAR: European League Against Rheumatism, NICE: National Institute of Health and Care Excellence, OARSI: Osteoarthritis Research Society International, PANLAR: Pan-American League of Associations for Rheumatology, TLAR: Turkish League Against Rheumatism, RACGP: Royal Australian College of General Practitioners, VA/DoD Veterans Affairs and Department of Defense

8.1.2.2 Quality domain scores from the ten CPGs

We also used the AGREE II instrument to determine quality scores for each of the six domains assessed for the 10 appraised CPGs. The results of the quality scores of each domain for the CPGs we appraised can be found in Table 1. The 23 individual raw and adjusted item scores for each of the 10 CPGs that were appraised can be found in Appendix 5. The quality scores of the CPGs in the six domains ranged from 6% to 100%. As hypothesized, domain 1 (scope and purpose), domain 3 (rigour of development) and domain 4 (clarity of presentation) were effectively addressed. The mean scores for domain 1 and 4 were 83% and 79% respectively, whereas the mean score for domain 3 was 69%. As expected, domain 5 (applicability) and

domain 6 (editorial independence) were the least effectively addressed. Of the two domains, domain 5 had the lower mean score. The assumption that domain 2 (stakeholder involvement) would not be effectively addressed, was not supported. In fact, seven^{53,54,56-59,62} of the 10 CPGs scored > 60% in domain 2 and the mean score was 70%.

Table 1. Quality Domain Scores from Appraised Clinical Practice Guidelines

AGREE II DOMAINS						
	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6
EULAR ⁵⁷	83	78	65	78	27	21
NICE ⁵³	97	81	85	81	63	75
OARSI ⁵⁴	83	83	70	86	8	96
Ottawa Panel #1 ⁵⁸	78	69	61	81	6	29
Ottawa Panel # 2 ⁵⁹	78	64	60	86	26	33
Ottawa Panel # 3 ⁶⁰	75	50	59	78	10	29
PANLAR ⁶¹	64	53	32	75	24	38
RACGP ⁵⁶	100	94	92	100	83	83
TLAR ⁵⁵	72	44	75	23	25	42
VA/ DoD ⁶²	100	86	92	100	27	25
Mean \pm SD	83 \pm 12	70 \pm 17	69 \pm 18	79 \pm 21	30 \pm 25	47 \pm 27

AGREE: Appraisal of Guidelines for Research and Evaluation, Domain 1: Scope and Purpose, Domain 2: Stakeholder Involvement, Domain 3: Rigour of Development, Domain 4: Clarity of Presentation, Domain 5: Applicability, Domain 6: Editorial Independence; EULAR: European League Against Rheumatism, NICE: National Institute of Health and Care Excellence, OARSI: Osteoarthritis Research Society International, PANLAR: Pan-American League of Rheumatology Association, RACGP: Royal Australian College of General Practitioners, TLAR:

Turkish League Against Rheumatism, VA/DoD Veterans Affairs and Department of Defense;
SD: standard deviation

8.1.2.3 *Characteristics of the domains*

8.1.2.3.1 Domain 1 (scope of purpose)

As expected, all the guidelines that we appraised effectively addressed domain 1. The scope and purpose of the CPGs were well written and included explicit descriptions of the objectives of the guideline including the intent and benefit of the guideline. As well, the health questions addressed in the guideline were clearly discussed, and many guidelines included a description of the PICO (population, intervention, comparison, outcome) questions in the guideline or an appendix.

8.1.2.3.2 Domain 2 (stakeholder involvement)

In addition to effectively addressing domain 1, the higher quality guidelines also addressed domain 2 effectively. The higher quality guidelines included involvement from multiple stakeholders including primary care physicians, rheumatologists, orthopedic specialists, physical medicine specialists, physiotherapists, occupational therapists, nurses, pharmacists, social workers, guideline development experts, patients or patient representatives. Furthermore, the specialities, institutions and disciplines of those involved were described in detail. Lastly, the role of everyone in the guideline development process was discussed in the guideline, or in the appendices included with the guidelines.

In contrast, the guidelines that were not high quality did not have multi-disciplinary involvement in the development of the guidelines. For example, guidelines by PANLAR⁶¹ and TLAR⁵⁵ did not include input from physiotherapists, occupational therapists, nurses or social

workers. Furthermore, no patient input or patient representative input was obtained in the TLAR⁵⁵ guideline. As well, specific information about the individuals included in the guideline development process was lacking.^{59,61}

8.1.2.3.3 Domain 3 (rigour of development)

Domain 3 was effectively addressed by all high-quality CPGs. Rigour of development referred to thoroughness in which the guidelines were developed. The higher quality CPGs explicitly described what databases were searched, when they were searched, the search terms and the search strategy; the inclusion and exclusion criteria of the studies informing the guidelines; a method of assessing the risk of bias of the included studies; a description of how the recommendations were formulated; whether or not a benefits/risk evaluation of the evidence was completed; determined if a clear link between the recommendations and evidence existed; explained the external peer review process that occurred; and detailed a procedure and date for update of the guideline.

On the other hand, low quality guidelines did not include a full description of the literature search including search terms and dates,⁶¹ nor the full search strategy.^{55,61} The inclusion and exclusion criteria for studies that were used to inform the recommendations were not well written.⁵⁵ Evidence tables, summary of findings tables, and discussions on the risk-benefit ratios of the recommendations were usually missing from the lower quality guidelines.^{55,58,60,61} As well, the lower quality guidelines either did not complete a peer review process^{58,60,61} or did not describe the process thoroughly enough.⁵⁵ Lastly, the lower quality guidelines failed to provide precise information regarding if and when an update of the guideline was going to occur.

8.1.2.3.4 Domain 4 (clarity of presentation)

All but one guideline⁵⁵ addressed domain 4 effectively. These CPGs consisted of clear and concise key recommendations that included specific details about the purpose, intent and population who the key recommendations were intended for. As well, the key recommendations were easily identifiable in all the guidelines, with different approaches taken to highlight them. Some guidelines included an executive or plain language summary^{53,56} with bolded headings and concisely written statements that users could refer to without having to sift through numerous pages of information. Other guidelines included in a table,⁵⁷ diagram⁵⁵ or algorithm⁵⁴ that would help users identify key recommendations.

8.1.2.3.5 Domain 5 (applicability)

Domain 5 was one of the domains that was the least effectively addressed across most the guidelines. The guidelines developed by NICE⁵³ and RACGP⁵⁶ were the only two CPGs that effectively addressed domain 5. These guidelines discussed barriers specific to implementing the guidelines. NICE provided support resources on their website about how best to use guidelines in clinical practice, how guidelines can help patient outcomes and how to overcome the challenges associated with behavior change.¹¹² As well, both of these guidelines included discussion and tables which highlighted the cost effectiveness of the recommendations. The RACGP guideline included a specific implementation plan, including dissemination of the guideline. Lastly, both guidelines eluded to establishing an auditing process to monitor application and use of the guidelines. The NICE website included information about how much uptake of key recommendations have occurred and the RACGP monitored the frequency of downloads of their guideline.

Guidelines that had lower domain 5 scores did not mention any barriers or facilitators to the application of the guidelines. They did not discuss strategies to put the recommendations into practice nor discuss the resource implications of the guidelines. Furthermore, they rarely acknowledged if and how the use and application of the recommendations and guidelines were being monitored.

8.1.2.3.6 Domain 6 (editorial independence)

The guidelines developed by NICE,⁵³ OARSI⁵⁴ and the RACGP⁵⁶ were the only guidelines to effectively address domain 6. They did this by succinctly stating if funding was obtained to help develop or update the guideline, the amount of funding, where the funding was obtained from and explicitly stated if the funding source influenced the development or update of the of the guideline in any way. Furthermore, these guidelines thoroughly described if any individuals involved in the guideline development process had a conflict of interest, what the conflict of interest was, how the conflict was reported, when the conflicts were reported and what occurred if there was a conflict i.e. removed from voting process.

The remaining guidelines that did not effectively address domain six failed to thoroughly describe if funding was obtained, who funded the process and if the funding source influenced the guideline development process in any way. While some of the guidelines did acknowledge that individuals involved in the guideline development process had conflicts of interest, little details were provided describing these conflicts and how they were handled.

8.1.3 Determining the highest quality CPGs

An a priori decision was made that high-quality guidelines would have to meet the following criteria: 1) score > 60% in at least four of the six domains and 2) domain 3 (rigour of development) must be one of the four domains which scored > 60%. Based on this criteria, the CPGs developed by EULAR,⁵⁷ NICE⁵³, OARSI,⁵⁴ Ottawa Panel #1,⁵⁸ the RACGP,⁵⁶ and the VA/DoD⁶² were high quality. Table 2 highlights the domains scores of the high-quality guidelines. All six domains were effectively addressed in the CPGs developed by the RACGP⁵⁶ and NICE.⁵³ The OARSI⁵⁴ guideline effectively addressed five out of six domains and the remaining three CPGs effectively addressed four out of six domains.^{57,58,62} The highest domain score achieved was 100% for domain 1 (scope and purpose) and lowest score was 6% for domain 5 (applicability). The guideline developed by the RACGP⁵⁶ stood out amongst the other CPGs. It was a well-written document, that included an easy-to-read executive summary highlighting all the key recommendations for helping people with knee OA live well. Furthermore, supportive documentation was provided describing the study methodology; key stakeholders involved in the guideline development process; the communication, implementation and dissemination plan and results of the public consultation. By providing these supportive documents, end-users may have a greater appreciation for the time and work it took to develop this guideline. As well, end-users should be confident in the transparency in which it was developed. Lastly, the RACGP⁵⁶ guideline and all supporting documents can be accessed at no cost on the internet.

Table 2. High Quality Clinical Practice Guidelines and their Domain Scores

AGREE II DOMAINS						
	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6
EULAR ⁵⁷	83	78	65	78	27	21
NICE ⁵³	97	81	85	81	63	75
OARSI ⁵⁴	83	83	70	86	8	96
Ottawa Panel #1 ⁵⁸	78	69	61	81	6	29
RACGP ⁵⁶	100	94	92	100	83	83
VA/ DoD ⁶²	100	86	92	100	27	25
Mean \pm SD	90 \pm 10	82 \pm 8	78 \pm 13	88 \pm 10	36 \pm 31	55 \pm 33

AGREE: Appraisal of Guidelines for Research and Evaluation, Domain 1: Scope and Purpose, Domain 2: Stakeholder Involvement, Domain 3: Rigour of Development, Domain 4: Clarity of Presentation, Domain 5: Applicability, Domain 6: Editorial Independence; EULAR: European League Against Rheumatism, NICE: National Institute of Health and Care Excellence, OARSI: Osteoarthritis Research Society International, RACGP: Royal Australian College of General Practitioners, VA/DoD: Veterans Affairs and Department of Defense; SD: standard deviation

8.1.4 Interrater reliability scores

We conducted intraclass correlation coefficient (ICC) estimates and their 95% confidence intervals (CIs) on the raw AGREE II domain scores using SPSS 25 based on a mean rating (K=2), absolute agreement, one-way random effects model.^{113,114} The results from the ICC analysis are presented in Table 3 and as indicated the scores ranged from 0.34 (poor reliability) to 0.91 (high reliability). Two pairs of evaluators appraised the 10 CPGs. One pair evaluated seven CPGs whereas the other pair evaluated three CPGs.

Table 3. ICC Scores for Appraised Clinical Practice Guidelines

AGREE II Domains	N	K	ICC (random)	Lower 95% CI	Upper 95% CI	P value
Domain 1	10	2	0.90 (high)	0.62	0.98	0.001
Domain 2	10	2	0.62 (moderate)	-0.43	0.90	0.073
Domain 3	10	2	0.95 (high)	0.80	0.99	0.000
Domain 4	10	2	0.34 (poor)	-1.49	0.83	0.263
Domain 5	10	2	0.91 (high)	0.64	0.98	0.001
Domain 6	10	2	0.75 (good)	0.06	0.94	0.021

AGREE: Appraisal of Guidelines for Research and Evaluation, Domain 1: Scope and Purpose, Domain 2: Stakeholder Involvement, Domain 3: Rigour of Development, Domain 4: Clarity of Presentation, Domain 5: Applicability, Domain 6: Editorial Independence; n= number of included clinical practice guidelines, K= number of raters, ICC= intraclass correlation coefficient, CI=confidence interval

8.1.5 Summary of findings from the clinical practice guidelines appraised in our study

As hypothesized, nearly all CPGs for people with knee OA recommended individualized, patient-centered care with a focus on self-management, education, exercise and weight-loss.⁵³⁻⁶²

The guidelines often referred to education, exercise and weight-loss as core interventions or standard components of non-pharmacological treatment. They also recommended setting realistic goals with people with knee OA. Furthermore, the guidelines encouraged that patient preferences, capabilities, accessibility to local facilities and availability of local resources be considered. Lastly, the guidelines emphasized that people with knee OA should be offered non-

pharmacological interventions first before medications or referral to other specialists such as orthopedic surgeons.

8.1.5.1 Core interventions

Education, exercise and weight management were the core interventions that nearly all CPGs recommended be offered to people with knee OA.^{53–56,61,62} Within the guidelines it was recommended these interventions should be offered regardless of the severity of OA,⁵⁵ amount of pain,⁵³ age,⁵³ presence of comorbidities⁵³ and disability.⁵³ They constituted the foundation of non-pharmacological and non-surgical interventions and according to the guidelines, should be offered as part of the treatment plan for people with knee OA upon initial diagnosis.^{53,54,56,62} The recommendations specific to the core interventions were based on evidence that demonstrated the net benefits outweighed the risks,^{56,62} even though some of the evidence informing the recommendations was of low or very low quality.⁵⁶ The aims of core interventions are to reduce pain, improve mobility and enhance quality of life.

While there was consistency amongst the CPGs with regards to specific recommendations about core interventions, variability was evident in the details about these core interventions, including exercise, education and weight management advice. Table 4 highlights the differences in the types of exercise recommended by some of the CPGs. Strengthening exercise was a consistent recommendation across many CPGs. Topics of education that were recommended to be discussed were varied, and included disease information,^{53,55} lifestyle modifications,^{55,61,62} treatment goals^{55,61} and OA misconceptions.⁵³

Table 4. Types of Exercise Recommended by Clinical Practice Guidelines

	Exercise					
	Aerobic	Strength (local)	Land Based	Water Based	Tai Chi	Flexibility/Stretch
EULAR ⁵⁷	•	•				•
NICE ⁵³	•	•				
OARSI ⁵⁴		•	•	•		
PANLAR ⁶¹	•	•				•
RACGP ⁵⁶	Walk	•	•		•	
TLAR ⁵⁵		•		•	•	
VA/ DoD ⁶²	•	•	•	•		•

EULAR: European League Against Rheumatism, NICE: National Institute for Health and Care Excellence, OARSI: Osteoarthritis Research Society International, PANLAR: Pan American League of Associations for Rheumatology, RACGP: Royal Australian College of General Practitioners, TLAR: Turkish League Against Rheumatism, VA/DoD: Veterans Affairs and Department of Defense

Several guidelines specifically stated that individuals with a body mass index (BMI) > 25 should be provided with interventions or education to help with weight-loss, but did not clearly state what those interventions should be.^{55,56,62} Within these same guidelines, the recommendations suggested that weight-loss should aim to be between five to seven percent of the individuals' current body weight. The guideline from NICE⁵³ stated that weight-loss was recommended for individuals who were over-weight or obese, but it did not suggest a target for weight-loss. The OARSI⁵⁴ guideline stated that weight management was appropriate but did not specify for who and an amount of weight-loss to aim for. The guideline from the RACGP⁵⁶

recommended that individuals who had a healthy weight be provided education on the importance of maintaining that weight, but it did not define “healthy weight”.

Because the three CPGs developed by Brosseau et al⁵⁸⁻⁶⁰ and the guideline developed by EULAR⁵⁷ provided recommendations explicit to physical activity, they did not categorize their recommendations as “core interventions”. Each of the three CPGs developed by Brosseau et al⁵⁸⁻⁶⁰ focused on a specific type of physical activity whereas the EULAR⁵⁷ guideline provided general physical activity recommendations. The first CPG developed by Brosseau et al⁵⁸ included recommendations for mind-body exercises, specifically hatha yoga, Qigong tai chi and sun style tai chi, the second guideline was specific to strengthening exercises and the final guideline provided recommendations directed at aerobic exercise.

8.1.5.2 Adjunct non-pharmacological interventions

Most guidelines included recommendations about additional types of non-pharmacological interventions that could be offered to individuals with knee OA, even though these suggestions were not considered to be part of standard treatment for every individual with knee OA.^{53-56,61,62} Four guidelines did not discuss adjunct non-pharmacological recommendations because the guidelines focused solely on exercise or physical activity.⁵⁷⁻⁶⁰ The recommendations specific to adjunct or additional non-pharmacological treatment were not as strongly endorsed by the guidelines because they were based on low or very low evidence.⁵⁶ Thermotherapy (heat/ice therapy),^{53,55,56,61} gait aids,^{53,54,56,61,62} and biomechanical support devices such as insoles,^{53,54} and knee braces,^{53-55,61} were the most commonly recommended types of adjunct treatments found in the guidelines. Other adjunct interventions suggested included manual therapy,^{53,56,62} transcutaneous electrical stimulation (TENS),^{53,55,56} water-based

exercises,^{56,62} hydrotherapy,⁶¹ cycling,⁵⁶ hatha yoga,⁵⁶ massage therapy⁵⁶, interferential current (IFC),⁵⁵ ultrasound,⁵⁵ manipulation,⁵³ stretching⁵³ and cognitive behavior therapy.⁵⁶ Further details on adjunct treatments recommended by the CPGs the relationship to the overall quality score as determine by the AGREE II¹⁰¹ can be found in Table 5.

A few guidelines included neutral recommendations or recommendations against the use of use of adjunct interventions. The guideline developed by the RACGP⁵⁶ included neutral recommendations for unloading braces for lateral knee OA, medial wedge orthotics, patellar tape and shortwave therapy. Furthermore, this guideline included conditional recommendations against the use of cold therapy, unloading braces for medial knee OA, lateral wedge shoe orthotics, kinesiotape, ultrasound, IFC and special footwear for knee OA. Both the RACGP⁵⁶ and the NICE⁵³ guidelines included recommendations against acupuncture. However, acupuncture had a neutral recommendation from the VA/Dod⁶² and OARSI⁵⁴ guidelines. More information on the adjunct interventions that were not recommended or had neutral recommendations from the CPGs and the relationship to the overall quality score as determine by the AGREE II,¹⁰¹ can be found in Table 5.

Table 5. Clinical Practice Guideline Overall Score and Relationship to Adjunct Interventions

AGREE II Overall Quality Score	Adjunct Interventions										
	AROM	Acu-puncture	Gait aid	Knee brace	Joint mobs/manips	Orthotics	Stretch	Tape	Thermo-therapy	TENS/IFC	Ultra-sound
80-100%											
RACGP		×	✓	×/N	✓	×/N		×/N	Heat ✓ Cold ×	TENS ✓ IFC ×	×
NICE		×	✓	✓	✓	✓	✓		✓	✓	
OARSI		?	✓	✓		✓				?	?
VA/DoD		N	✓		✓						
<49%											
PANLAR	✓		✓	✓		✓	✓	✓	✓		
TLAR			✓	✓		✓			✓	✓	✓

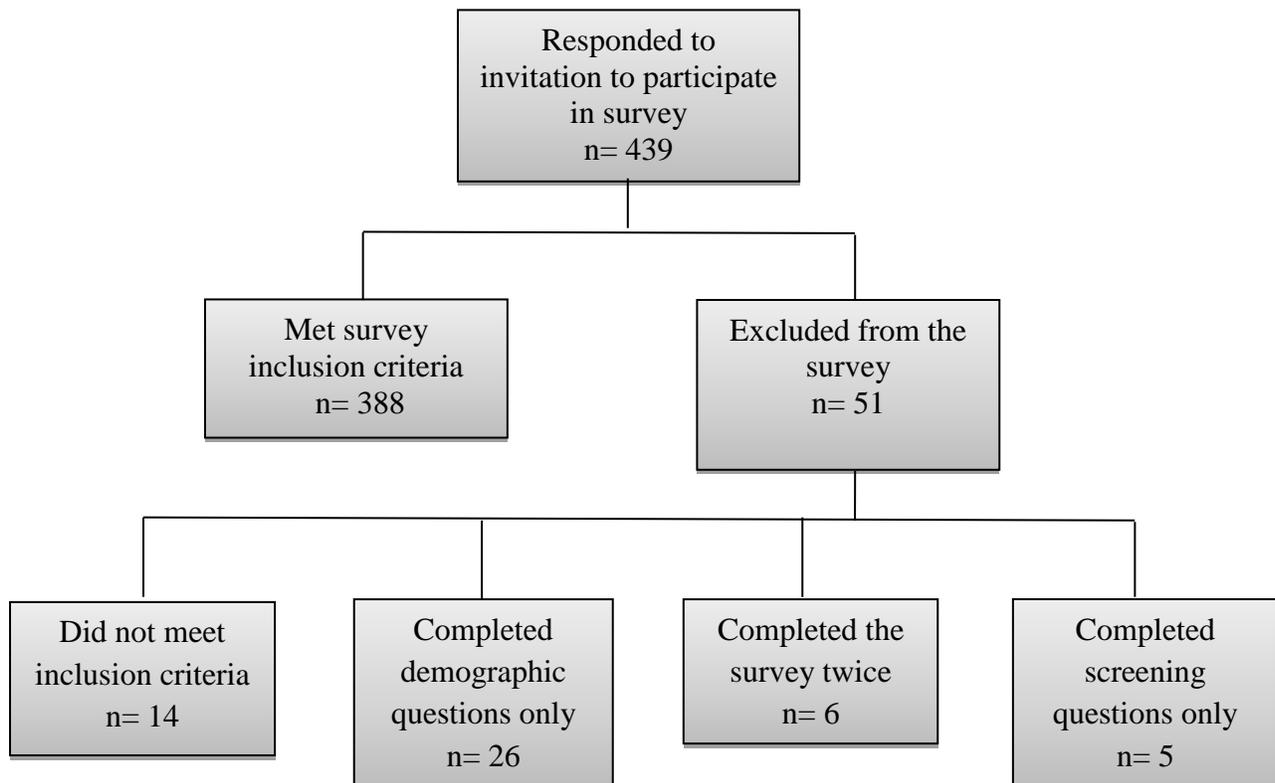
AGREE II: Appraisal of Guidelines for Research and Evaluation II, EULAR: European League Against Rheumatism, NICE: National Institute of Health and Care Excellence, OARSI: Osteoarthritis Research Society International, PANLAR: Pan-American League of Rheumatology Association, RACGP: Royal Australian College of General Practitioners, TLAR: Turkish League Against Rheumatism, VA/DoD Veterans Affairs and Department of Defense, AROM: active range of motion, mobs: mobilizations, manips: manipulations, PROM: passive range of motion, TENS: transcutaneous electrical stimulation, IFC: interferential current, ✓: recommended, ×: not recommended, ? : uncertain (ambiguous nature of the evidence or guideline developers could not come to consensus regarding recommendation), N: neutral recommendation

8.2 Survey and vignette

8.2.1 Characteristics of the physiotherapists who were included in the data analysis

A total of 439 physiotherapists responded to the invitation to participate in the survey for an estimated response rate of three percent. See Figure 2 for details on the number of included and excluded physiotherapists from the survey.

Figure 2. Flowchart Outlining the Number of Respondents Eligible and Not Eligible for the Survey



Details pertaining to the demographic information of the respondents can be found in Table 6. Most of the respondents were female (76%), between the ages of 30-39 (34%) and employed in private practice (64%). As hypothesized, most physiotherapists were practicing for

greater than 10 years. Manitoba and Ontario had the highest number of respondents included in the survey, whereas and the Yukon and Nunavut had no respondents. As expected, most physiotherapists who responded to the survey had not taken a post-graduate course related to knee OA.

Table 6. Characteristics of Physiotherapists Participating in the Survey

Characteristic	n= 388 (%)
Gender (female)	293 (76)
Age	
20-29	66 (17)
30-39	132 (34)
40-49	85 (22)
≥ 50	105 (27)
Level of education	
Bachelor degree	197 (51)
MPT	97 (25)
MSc	80 (20)
Other	14 (4)

Length practicing (years)	
<5	84 (22)
5-10	81 (21)
11-15	53 (14)
≥ 15	170 (44)
Province/ territory of employment	
British Columbia	46 (17)
Alberta	64 (12)
Saskatchewan	4 (1)
Manitoba	129 (33)
Ontario	118 (30)
Quebec	5 (1)
Newfoundland	3 (0.8)
New Brunswick	3 (0.8)
Nova Scotia	11 (3)
Prince Edward Island	3 (0.8)

Northwest Territories	2 (0.5)
Primary employment setting	
Private practice	248 (64)
Hospital	75 (19)
Rehabilitation facility	15 (4)
Community	37 (10)
Other	13 (3)
Location primary employment setting	
Rural	14 (4)
Small urban centre	88 (23)
Medium urban centre	52 (13)
Large urban centre	234 (60)
Have not taken a course related to knee OA	230 (59)

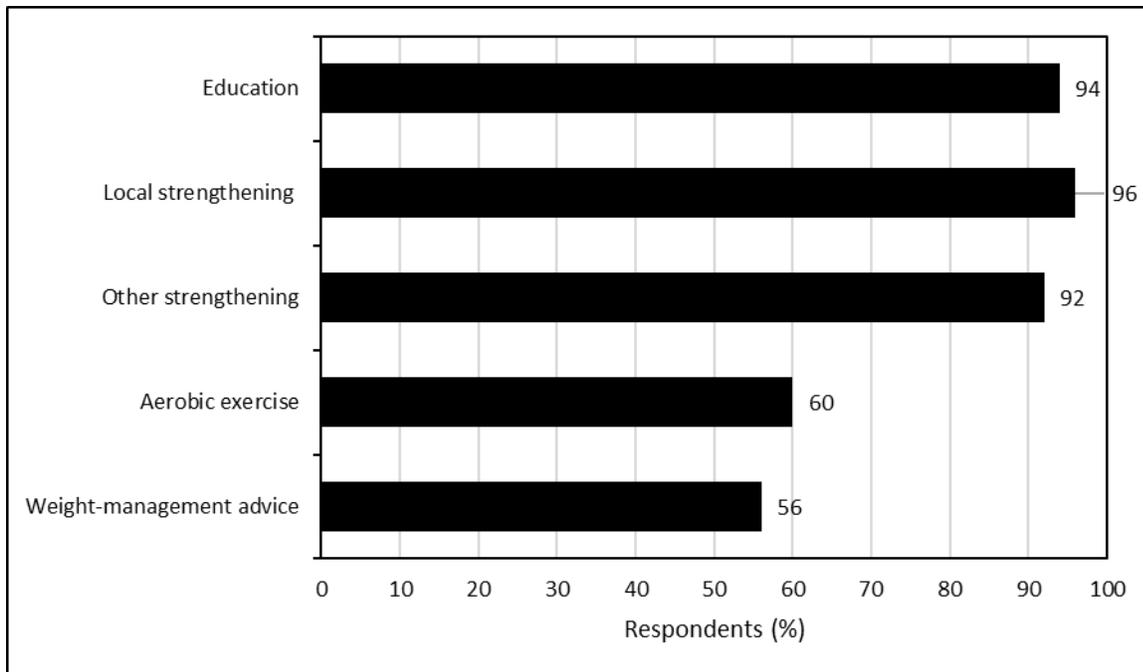
n: number of respondents, BMR-PT: Bachelor of Medical Rehabilitation, PT: physiotherapy, MPT: Master of Physical Therapy, MSc: Master of Science, CPGs: clinical practice guidelines, OA: osteoarthritis

8.2.2 The self-reported clinical practice of the physiotherapists included in the study

8.2.2.1 Core non-pharmacological interventions

The core non-pharmacological interventions utilized by the physiotherapists when treating people with knee OA are summarized in Figure 3. Nearly all physiotherapists reported they prescribed local strengthening exercises (96%) whereas, weight-management was the least offered core intervention provided by physiotherapists (56%). As hypothesized, most physiotherapists provided education and strengthening exercises.

Figure 3. Percentage of Respondents who Prescribed Core Interventions (n= 388)

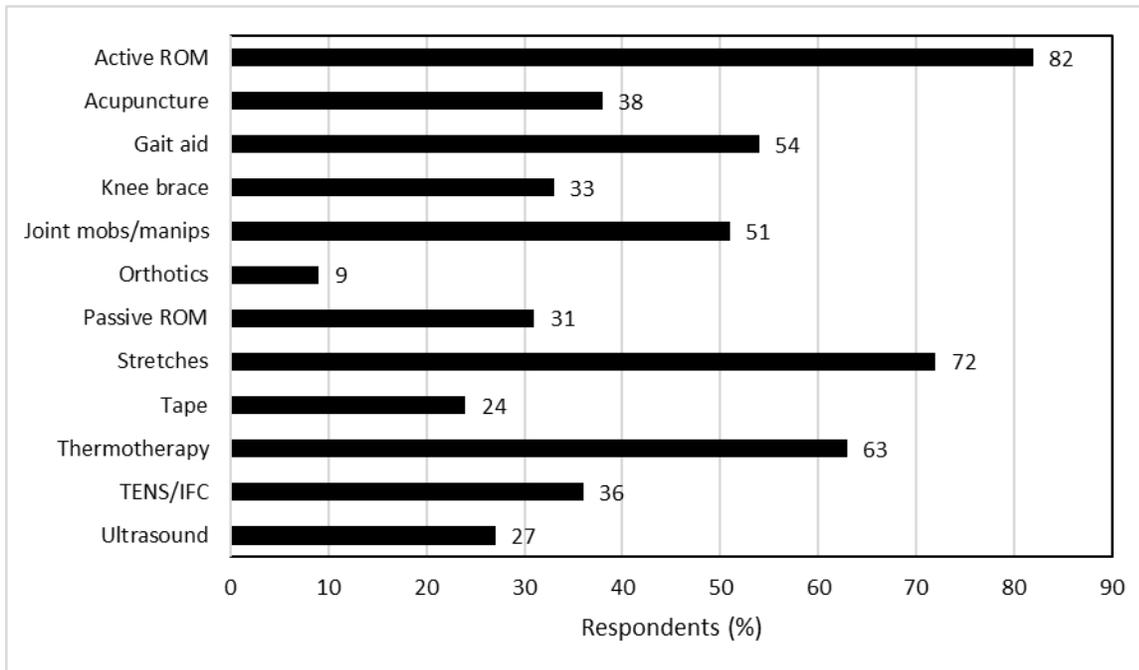


8.2.2.2 Adjunct non-pharmacological interventions

The types of adjunct non-pharmacological interventions prescribed by physiotherapists are highlighted in Figure 4. Active range of motion was the most commonly prescribed adjunct intervention (82%), whereas orthotics was the least prescribed (9%). Less than half of respondents provided ultrasound, TENS/IFC and acupuncture. Furthermore, only half of

respondents reported they would utilize joint mobilizations and manipulations as part of the treatment plan, whereas we hypothesized that most physiotherapists responding to the survey would use these techniques.

Figure 4. Percentage of Respondents who Prescribed Adjunct Interventions (n= 388)

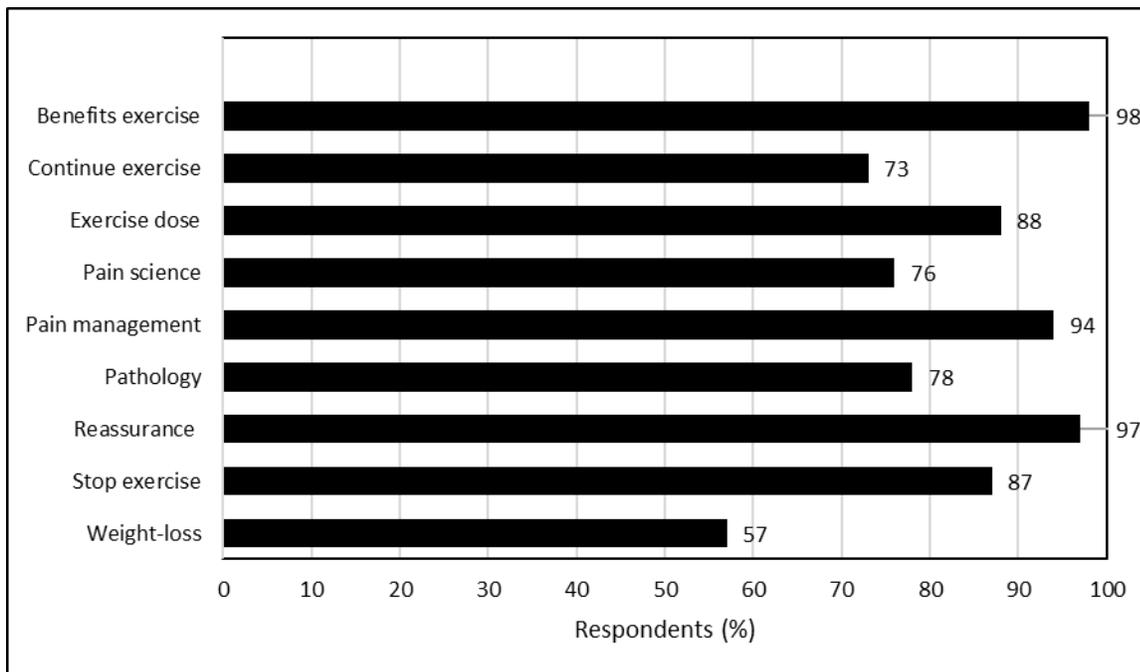


ROM: range of motion, mobs: mobilizations, manips: manipulations, TENS: transcutaneous electrical stimulation, IFC; interferential current

8.2.2.3 Education

The types of education provided by physiotherapists are described in Figure 5. Benefits of exercise, reassurance, and pain management were the most frequently discussed education topics. Consistent with the core non-pharmacological interventions offered, weight-loss was the least discussed education topic (57%).

Figure 5. Education Topics Discussed by Respondents (n= 388)



Continue exercise: when to keep exercising despite pain, Stop exercise: when to stop exercise due to pain, Pain science: what is pain, hurt versus harm

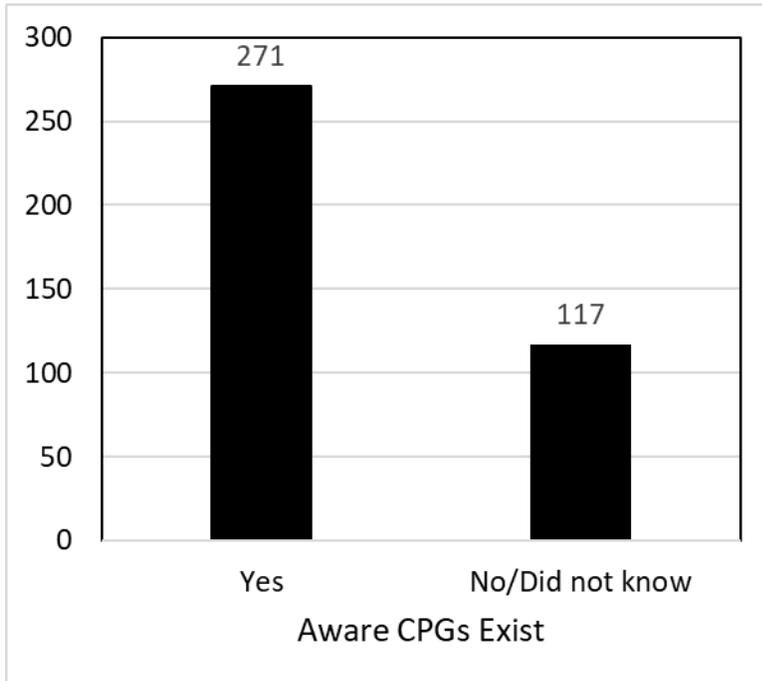
8.2.3 Information pertaining to clinical practice guidelines for knee osteoarthritis

We asked the respondents questions about their awareness of CPGs for knee OA, whether they followed CPGs for knee OA, their beliefs and confidence about using CPGs for knee OA and barriers and facilitators to CPG use.

8.2.3.1 Awareness of clinical practice guidelines

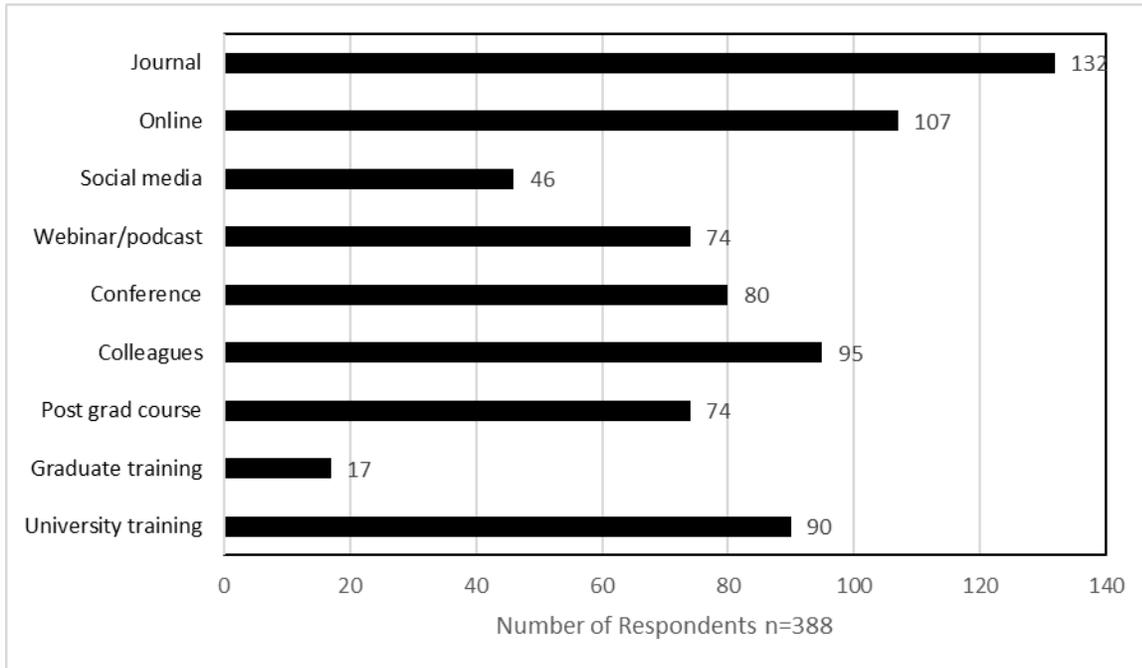
A total of 271 respondents reported they were aware that CPGs for knee OA existed (see Figure 6). We also asked respondents how they became aware of CPGs. These results can be found in Figure 7. Most respondents stated they learnt about CPGs for knee OA from journals whereas fewer respondents reported they used social media to learn about CPGs.

Figure 6. Number of Physiotherapists who were Aware of Clinical Practice Guidelines (n= 388)



CPGs: clinical practice guidelines

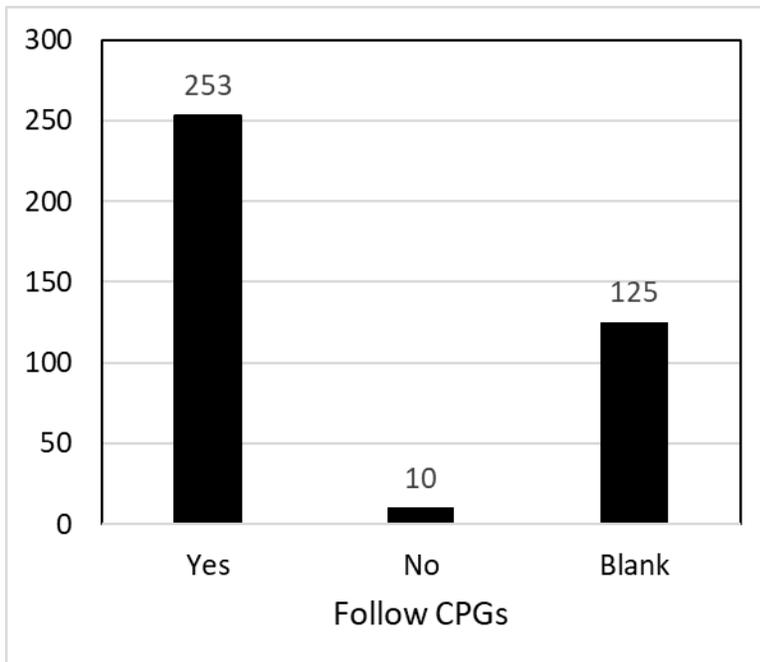
Figure 7. Sources from which Respondents Learnt About Clinical Practice Guidelines



8.2.3.2 Self-reported adherence to clinical practice guidelines

A total of 253 physiotherapists reported they followed CPGs compared to 125 respondents who left this question blank. Results pertaining to whether respondents followed or did not follow/did not answer CPGs can be found in Figure 8. When we combined the respondents, who answered “no” and those who left the question blank to the question if they follow CPGs for knee OA, 135 respondents or 35% of the sample were categorized into the “no/no answer”.

Figure 8. Number of Physiotherapists who Reported they Followed Clinical Practice Guidelines (n=388)

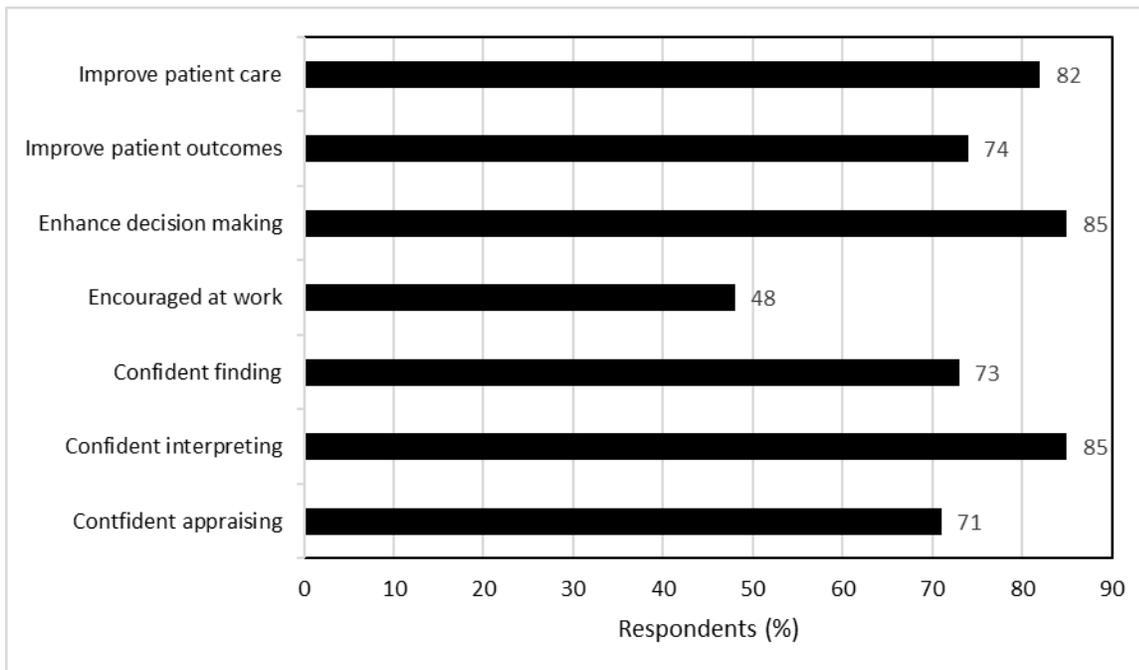


CPGs: clinical practice guidelines, n: number of respondents

8.2.3.3 Beliefs and confidence pertaining to clinical practice guidelines

The results about respondents' beliefs and confidence regarding CPGs can be found in Figure 9. Over 80% respondents reported CPGs improved patient care, enhanced decision making and reported they were confident interpreting the CPGs. Approximately half of the respondents indicated that the use of CPGs was encouraged at work.

Figure 9. Percentage of Respondents Agreeing with Statements Pertaining to Beliefs and Confidence about Clinical Practice Guidelines (n= 388)



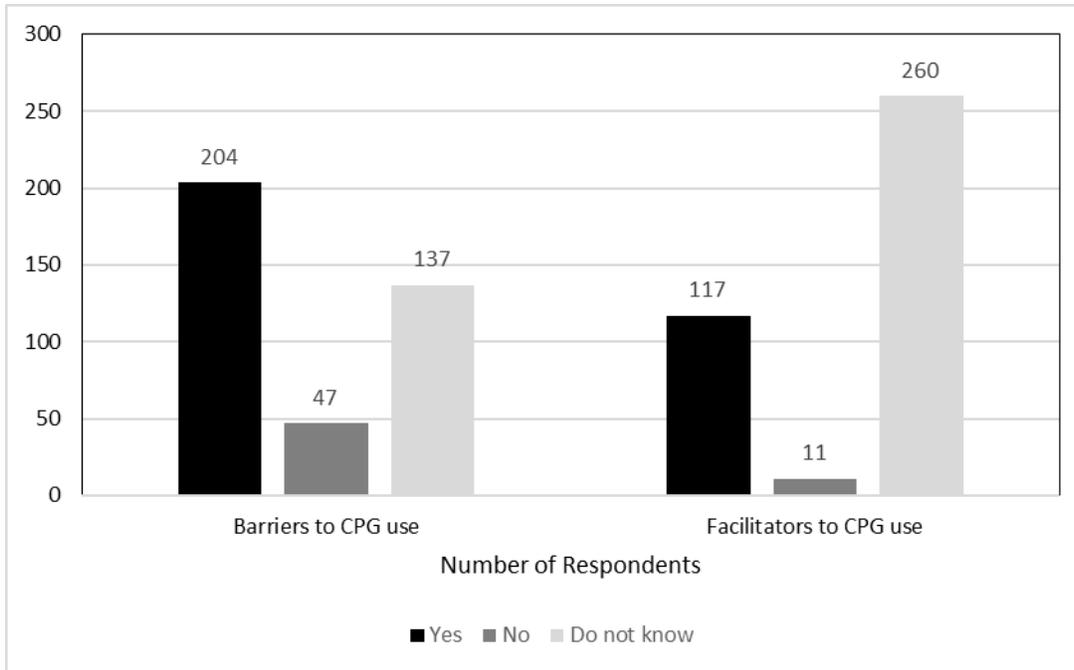
CPGs: clinical practice guidelines, n: sample size of respondents

8.2.3.4 Barriers and facilitators to utilizing clinical practice guidelines

We asked respondents whether they believed that barriers and facilitators to using CPGs existed. A total of 204 respondents indicated they believed barriers to CPG use existed compared

to 117 respondents who reported facilitators existed. More details regarding these responses can be found in Figure 10.

Figure 10. Number of Physiotherapists who Identified Barriers and Facilitators to using Clinical Practice Guidelines (n= 388)

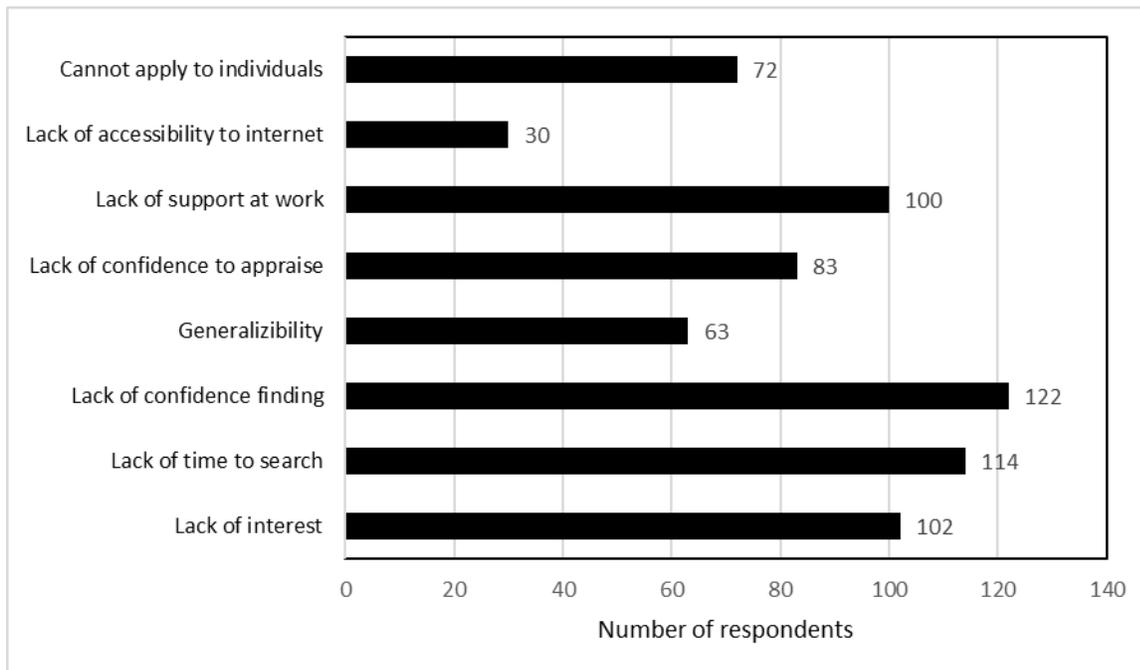


CPG: clinical practice guideline, n: number of respondents

When we asked respondents to identify barriers to CPG use, more than half of the sample reported confidence in finding CPGs, a lack of interest and the time to search for CPGs (see Figure 11). In addition, respondents stated that patient expectations and preferences, accessibility to publications, lack of resources, conflicting opinions from physicians and lack of awareness of CPGs were barriers to CPG use. Accessibility to the internet was reported as a facilitator by nearly all respondents who answered this question. Further details about facilitators to CPG use can be found in Figure 12. As well, continuing education opportunities, support from the

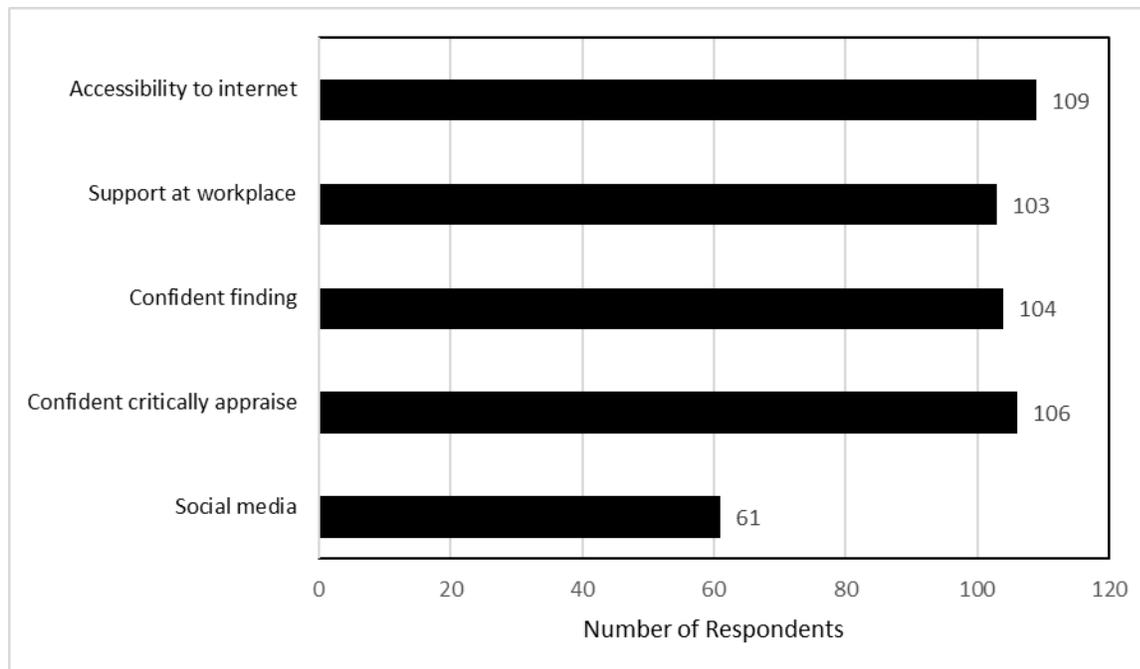
provincial physiotherapy association and access to a knowledge services manager, were additional facilitators identified to utilizing CPGs by the respondents.

Figure 11. Barriers to Using Clinical Practice Guidelines reported by Physiotherapists (n=204)



CPGs: clinical practice guidelines

Figure 12. Facilitators to Using Clinical Practice Guidelines reported by Physiotherapists
(n=117)



8.2.4 Clinical practice guidelines: differences between participants who reported they followed them and did not follow/did not answer

When we conducted the chi-square analyses, we checked the assumptions. We discovered that that some of the demographic independent variables had an expected count less than five therefore we used the Fisher's Exact Test in these circumstances. All other assumptions were met.

8.2.4.1 Demographic information

The findings of the chi-square analysis comparing demographic information between respondents who followed CPGs and did not follow/did not answer are presented in Table 7. We found there was a statistically significant difference between whether respondents followed

CPGs and the province of employment, $X^2 = 13.07$, $df = 4$, $N = 388$, $p = 0.01$. This association was weak. A greater proportion of physiotherapists employed in Ontario reported they followed CPGs. As well, there was a statistically significant difference between whether a respondent followed CPGs and had taken a post-graduate course related to knee OA, $X^2 = 9.19$, $df = 1$, $N = 388$, $p = 0.02$. A higher proportion of respondents that reported they followed CPGs had not taken a post-graduate course related to knee OA. However, this association was weak.

Table 7. Chi-square Analysis of Demographic Information between Physiotherapists who Followed Clinical Practice Guidelines and those who Did Not Follow/Did Not Answer

Variable	Follow CPGs		Value	Phi or Cramer's V
	Yes n= 253 (65%)	No/No Answer n= 135 (35%)		
Province of Employment			$X^2 = 13.07$ $p = 0.01^*$	0.18 (Cramer's V)
BC	34 (14)	12 (9)		
AB	39 (15)	27 (20)		
Prairie	74 (29)	59 (44)		
ONT	88 (35)	30 (22)		
East coast	18 (7)	7 (5)		
Post-graduate training related to OA			$X^2 = 9.19$ $p = 0.02^*$	0.15
Yes	117 (46)	41 (30)		
No	136 (54)	94 (70)		
Gender			4.15t $p = 0.13$	0.11
Female	188 (74)	105 (78)		
Male	62 (25)	25 (18)		
Other	3 (1)	6 (4)		
Age			$X^2 = 2.91$ $p = 0.41$	0.09
20-29	47 (19)	19 (14)		
30-39	80 (32)	52 (39)		

40-49	54 (21)	31 (23)		
≥ 50	72 (28)	33 (24)		
Years practicing			$X^2 = 3.54$ $p = 0.32$	0.10
<5	59 (23)	25 (19)		
5-10	53 (21)	28 (21)		
11-15	29 (11)	24 (18)		
>15	112 (45)	58 (42)		
Level of Education			1.58 t $p = 0.67$	0.07
other	11 (4)	3 (2)		
Bachelor degree	124 (49)	73 (54)		
MPT	65 (26)	32 (24)		
MSc	53 (21)	27 (20)		
Primary employment setting			2.49 t $p = 0.66$	0.08
Private practice	159 (63)	89 (66)		
Hospital	50 (20)	25 (19)		
Rehabilitation facility	9 (4)	6 (4)		
Community	24 (9)	13 (10)		
Other	11 (4)	2 (1)		
Primary employment location			$X^2 = 4.11$ $p = 0.25$	0.10
Rural	8 (3)	6 (4)		
Small urban	65 (26)	23 (17)		
Medium urban	33 (13)	19 (14)		
Large urban	147 (58)	87 (65)		

X^2 : Chi square value, p : p-value, n : sample, t : Fisher's Exact Test, CPGs: clinical practice guidelines, OA: osteoarthritis, BC: British Columbia, AB: Alberta and Northwest Territory, Prairie: Saskatchewan and Manitoba, ONT: Ontario, East Coast: Quebec, New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island, BMR: Bachelor of Medical Rehabilitation, PT: Physical therapy, MPT: Masters of Physical Therapy, MSc: Masters of Science, *: statistically significant difference

8.2.4.2 Core treatments

When we examined the differences between whether the respondents followed CPGs and the utilization of education, exercise, and weight-management advice, we found that aerobic exercise was the only core intervention to demonstrate a statistically significant difference. The Pearson chi-square results are presented in Table 8. The results indicated there was a statistically significant association between whether respondents followed CPGs and whether they prescribed aerobic exercise, $X^2 = 4.47$, $df = 1$, $N = 388$, $p = 0.04$. A greater proportion of physiotherapists that followed CPGs prescribed aerobic exercise. However, this was a weak association.

Table 8. Pearson Chi-square Analysis of Core Interventions between Physiotherapists who Followed Clinical Practice Guidelines and those who Did Not Follow/Did Not Answer

Variable	Follow CPGs		Value	Phi
	Yes n= 253 (65%)	No/No Answer n= 135 (35%)		
Aerobic exercise			$X^2 = 4.47$ $p = 0.04^*$	0.11
Yes	161 (64)	71 (53)		
No	92 (36)	64 (47)		
Education			$X^2 = 0.81$ $p = 0.37$	0.05
Yes	240 (95)	125 (93)		
No	13 (5)	10 (7)		
Leg strengthening			$X^2 = 0.092$ $p = 0.76$	-0.02
Yes	242 (96)	130 (96)		
No	11 (4)	5 (4)		
Weight management advice			$X^2 = 0.12$ $p = 0.91$	0.01
Yes	142 (56)	75 (55)		
No	111 (44)	60 (45)		

X^2 : Chi square value, p: p-value, n: sample, CPGs: clinical practice guidelines, *: statistically significant difference

8.2.4.3 *Adjunct interventions*

The adjunct interventions that we analyzed with the chi-square test included acupuncture, ultrasound, TENS/IFC, joint mobilizations/ manipulation, gait aid, knee braces, orthotics, passive range of motion, active range of motion, thermotherapy, stretches and tape. The findings are presented in Table 9. As the Pearson chi-square results demonstrated, there was a statistically significant difference between whether respondents followed CPGs and whether they prescribed thermotherapy, $X^2 = 6.75$, $df = 1$, $N = 388$, $p = 0.01$. A greater proportion of physiotherapists that followed CPGs prescribed thermotherapy. However, this association was weak.

Table 9. Pearson Chi-square Analysis of Adjunct Interventions between Physiotherapists who Followed Clinical Practice Guidelines and those that Did Not Follow/Did Not Answer

Variable	Follow CPGs		Value	Phi
	Yes n= 253 (65.2%)	No/ No Answer n= 135 (34.8%)		
Thermotherapy			$X^2= 6.75$ $p= 0.01^*$	-0.13
Yes	148 (58)	97 (72)		
No	105 (42)	38 (28)		
Active ROM			$X^2= 2.45$ $p= 0.12$	0.08
Yes	213 (84)	105 (78)		
No	40 (16)	30 (22)		
Acupuncture			$X^2= 0.48$ $p= 0.49$	-0.04
Yes	94 (37)	55 (41)		
No	159 (63)	80 (59)		
Gait aid			$X^2= 1.50$ $p= 0.22$	0.06
Yes	142 (56)	67 (50)		
No	111 (44)	68 (50)		
Joint mobilizations/ manipulations			$X^2= 0.002$ $p= 0.97$	0.00
Yes	128 (51)	68 (50)		
No	125 (49)	67 (50)		
Knee brace			$X^2= 0.07$ $p= 0.79$	-0.01
Yes	81 (32)	45 (14)		
No	172 (68)	90 (86)		
Orthotics			$X^2= 1.63$ $p= 0.20$	-0.07
Yes	20 (8)	16 (12)		
No	233 (92)	119 (88)		
PROM			$X^2= 0.31$ $p= 0.58$	0.03
Yes	80 (32)	39 (29)		
No	173 (68)	96 (71)		
Stretches			$X^2= 0.78$	0.05

Yes	185 (73)	93 (69)	p= 0.38	
No	68 (27)	42 (21)		
Tape			X ² = 1.58 p= 0.21	0.06
Yes	65 (26)	27 (20)		
No	188 (74)	108 (80)		
TENS/IFC			X ² = 0.13 p= 0.72	-0.2
Yes	89 (35)	50 (37)		
No	164 (65)	85 (63)		
Ultrasound			X ² = 0.44 p= 0.83	0.01
Yes	70 (28)	36 (27)		
No	183 (72)	99 (73)		

X²: Chi square value, p: p-value, n: sample, CPGs: clinical practice guidelines, TENS: transcutaneous electrical stimulation, IFC: interferential current, PROM: passive range of motion, ROM: range of motion, *: statistically significant difference

8.2.4.4 Types of education discussed by physiotherapists

The types of education that physiotherapists reported they would discuss with patients that we analyzed with the chi-square tests were pathology, benefits of physical activity, exercise dose, pain management strategies, when to stop exercising because of pain, when to keep exercising despite pain, pain science i.e. hurt versus harm, reassurance and weight-loss advice. The findings are presented in Table 10. According to the Pearson chi-square analyses, there was a statistically significant difference between whether respondents followed CPGs and discussed exercise dose, $X^2 = 4.71$, $df = 1$, $N = 388$, $p = 0.03$. A greater proportion of physiotherapists that reported they followed CPGs discussed exercise dose. However, this association was weak.

Table 10. Pearson Chi-square Analysis of Education between Physiotherapists who Followed Clinical Practice Guidelines and those who Did Not Follow/Did Not Answer

Variable	Follow CPGs		Value	Phi
	Yes n= 253 (65%)	No/No Answer n= 135 (35%)		
Pathology			$X^2 = 3.90$ $p = 0.05$	0.10
Yes	204 (81)	97 (72)		
No	49 (19)	38 (28)		
Benefits of physical activity			$X^2 = 0.20$ $p = 0.65$	0.02
Yes	249 (98)	132 (98)		
No	4 (2)	3 (2)		
Exercise dose			$X^2 = 4.71$ $p = 0.03^*$	0.11
Yes	229 (91)	112 (83)		
No	24 (9)	23 (17)		
Keep exercising			$X^2 = 0.35$ $p = 0.55$	0.03
Yes	187 (74)	96 (71)		
No	66 (26)	39 (29)		
Stop exercising			$X^2 = 0.11$ $p = 0.74$	-0.02
Yes	220 (87)	119 (88)		
No	33 (13)	16 (12)		
Pain science			$X^2 = 2.96$ $p = 0.09$	0.09
Yes	198 (78)	95 (70)		
No	55 (22)	40 (30)		
Reassurance			$X^2 = 0.77$ $p = 0.38$	0.04
Yes	246 (97)	129 (96)		
No	7 (3)	6 (4)		
Weight-loss advice			$X^2 = 0.07$ $p = 0.79$	0.01
Yes	146 (58)	76 (56)		
No	107 (42)	59 (44)		
Pain management			$X^2 = 0.38$	0.03

Yes	240 (95)	126 (93)	p= 0.54	
No	13 (5)	9 (7)		

X^2 : Chi square value, p: p-value, n: sample, CPGs: clinical practice guidelines, *: statistically significant difference

8.2.4.5 Beliefs and confidence regarding clinical practice guidelines

When we conducted a chi-square analysis to examine beliefs specific to whether CPGs enhance decision making, improve patient care, improve patient outcomes and are encouraged at the workplace; and physiotherapists confidence in ability to find, interpret and critically appraise CPGs, we found statistically significant differences in all seven of these variables. Table 11 reports these results. The strength of the associations between whether the respondents followed CPGs and beliefs regarding CPGs were weak. Likewise, the strength of the associations between whether the respondents followed CPGs and confidence about them were weak.

Table 11. Pearson Chi-square Analysis about Beliefs Regarding Guidelines between Physiotherapists Who Followed Clinical Practice Guidelines and those who Did Not Follow/ Did Not Answer

Variable	Follow CPGs		Value	Phi
	Yes n= 253 (65%)	No/ No Answer n= 135 (35%)		
Enhance decision making			$X^2 = 11.59$ $p = 0.01^*$	0.17
Yes	226 (89)	103 (76)		
No	27 (11)	32 (24)		
Improve patient care			$X^2 = 32.74$ $p < 0.01^*$	0.29
Yes	228 (90)	90 (67)		
No	25 (10)	45 (33)		
Improve patient outcomes			$X^2 = 35.22$ $P < 0.01^*$	0.30
Yes	211 (83)	75 (56)		
No	42 (17)	60 (44)		
CPGs are encouraged work			$X^2 = 57.04$ $p < 0.01^*$	0.38
Yes	158 (62)	30 (22)		
No	95 (38)	105 (78)		
Confidence finding			$X^2 = 70.18$ $p < 0.01^*$	0.43
Yes	220 (87)	64 (47)		
No	33 (13)	71 (53)		
Confidence interpreting			$X^2 = 17.06$ $p < 0.01^*$	0.21
Yes	229 (91)	101 (75)		
No	24 (9)	34 (25)		
Confidence appraising			$X^2 = 11.14$ $p < 0.01^*$	0.17
Yes	196 (77)	83 (61)		
No	57 (23)	52 (39)		

X^2 : Chi square value, p: p-value, n: sample, CPGs: clinical practice guidelines, *: statistically significant difference

8.2.4.6 Barriers and facilitators associated with utilizing clinical practice guidelines

We conducted chi-square analyses to determine if there were any differences between whether respondents followed CPGs and whether they believed there were barriers or facilitators to utilizing CPGs. The results of these analyses are presented in Table 12. We found statistically significant differences between whether respondents followed CPGs and whether they believed barriers or facilitators to their use existed. A higher proportion of respondents who reported they followed CPGs believed there were barriers to utilizing CPGs. However, this association was weak. A higher proportion of respondents who reported they followed CPGs reported that no facilitators existed or that they did not know if facilitators to CPG use existed. This was also a weak association.

Table 12. Pearson Chi-square Analysis about the Existence of Barriers and Facilitators to using Guidelines between Physiotherapists who followed Clinical Practice Guidelines and those who Did Not Follow/ Did Not Answer

Variable	Follow CPGs		Value	Phi
	Yes n= 253 (65)	No/ No Answer n= 135 (35%)		
Barriers to utilizing			$X^2= 5.49$ $p= 0.02^*$	0.12
Yes	144 (57)	60 (44)		
No/ Did not know	109 (43)	75 (56)		
Facilitators to utilizing			$X^2= 32.93$ $p <0.01^*$	0.29
Yes	101 (40)	16 (12)		
No/ Did not know	152 (60)	119 (88)		

X^2 : Chi square value, p: p-value, n: sample, CPGs: clinical practice guidelines, *: statistically significant difference

8.2.5 Binominal logistic regression analysis

Binomial logistic regression was used to determine if certain predictor variables influenced the likelihood of physiotherapists prescribing the core interventions. We used the following predictor variables in the regression analysis: gender; age; primary employment setting; level of education; number of years practicing; province or territory licensed to practice physiotherapy in; taken a post-graduate course related to knee OA; and self-reported adherence to CPGs. Statistical assumptions were checked. Multicollinearity was discovered between two variables, age and number of years practicing. Age was removed from the analysis and multicollinearity was no longer present. Furthermore, according to the formula from Peduzzi,¹¹¹ we discovered we did not have a large enough sample size to complete binominal logistic regression for the following two core interventions: education and strengthening exercise. The reason for this was because so few respondents in the survey stated they did not provide these interventions. As such, the regression analysis was conducted on aerobic exercise and weight-management only.

In terms of aerobic exercise, the only predictor variable that demonstrated a statistically significant relationship was primary employment setting. Physiotherapists who stated their primary employment setting was hospital-based were less likely to prescribe aerobic exercise for people with knee OA, $p = 0.04$, $OR = 0.19$ (95% $CI = 0.04- 0.92$) compared to physiotherapists whose primary employment setting was categorized as “other.”

With regards to weight-management advice, two predictor variables demonstrated statistically significant relationships, level of education and whether a physiotherapist had taken post-graduate training related to knee OA. Physiotherapists who completed an MPT degree were

2.5 times more likely to discuss weight-management with people with knee OA, $p < 0.01$, $OR = 2.54$, (95% $CI = 1.28- 5.01$), compared to physiotherapists who earned an MSc degree.

Likewise, physiotherapists who had taken a course related to knee OA were 1.9 times more likely to discuss weight management with people with knee OA, $p = 0.01$, $OR = 1.90$, (95% $CI = 1.41- 2.90$), compared to those who had not taken a course related to knee OA.

9 Discussion

9.1 Critical appraisal of clinical practice guidelines

9.1.1 Summary of results

The aims of the critical appraisal were to assess the quality of newly developed or newly updated CPGs for people with knee OA using the AGREE II instrument, determine the highest quality CPGs, examine interrater reliability between evaluators who assessed the quality of the guidelines and summarize the findings specific to non-pharmacological interventions of the recently appraised CPGs. Our search found 10⁵³⁻⁶² CPGs that met our inclusion criteria. Based on the results from the AGREE II, overall quality scores of the 10 CPGs ranged between 42%-100% (Figure 1). Of the six domains assessed by the AGREE II, domain 1 (scope and purpose) was effectively addressed by all 10 CPGs (Table 1). Domain 5 (applicability) and domain 6 (editorial independence) were the least effectively addressed by all 10 CPGs (Table 1). Using predetermined criteria, we found that six^{53,54,56-58,62} CPGs were high quality (Table 2). These six CPGs effectively addressed at least four domains and one of the domains was domain 3 (rigour of development). We agreed that the CPG developed by the Royal Australian College of General Practitioners (RACGP) was an exceptional document. ICC scores as determined by the interrater reliability analysis, ranged from poor to high (Table 3). We discovered that nearly all CPGs recommended individualized patient-centred care, that focused on self-management and realistic

goal setting. Furthermore, six of the guidelines encouraged that exercise, weight-management and education be the first line of non-pharmacological interventions offered to all individuals with knee OA, regardless of the individual's age, severity of OA or severity of pain. Lastly, six guidelines provided recommendations for adjunct non-pharmacological treatments but there was variability in the recommendations specific to adjunct interventions (Table 5).

9.1.2 Comparing recent critical appraisals

As previously stated, we appraised 10 CPGs using the AGREE II instrument, whereas Brosseau et al⁴³ appraised 17 CPGs and Nelson et al⁶⁷ appraised 16 CPGs. We limited the CPGs we appraised to include those that discussed non-pharmacological management of knee OA. We excluded CPGs if they only discussed pharmacological management, surgical management or if they were developed for a joint other than the knee. However, the critical appraisal conducted by Brosseau et al⁴³ included a CPG developed for hand OA. Likewise, Nelson et al⁶⁷ included CPGs developed for the hand only, hip only, orthotics and pharmacological interventions in their critical appraisal. Both ourselves and Brosseau et al⁴³ reported the overall mean quality domain scores in all six domains for the CPGs we each appraised. However, Nelson et al⁶⁷ did not report the overall mean quality domain scores, nor did they report the individual quality domain scores for each CPG they appraised. We received the individual quality domain scores for each CPG Nelson et al⁶⁷ appraised from Dr. Nelson (Amanda E. Nelson, MD, MSCR, email communication, February 26th, 2019). From these scores we calculated the mean quality domain scores of the 16 CPGs using an online standard deviation/ mean calculator.¹⁰²

Overall, we found that our critical appraisal had higher mean quality domain scores across all six domains when compared to Nelson et al⁶⁷ and in five of six domains when

compared to Brosseau et al.⁴³ The score for Domain 4 was 86% in the appraisal conducted Brosseau et al,⁴³ whereas it was 79% in our study. This domain score from Brosseau et al⁴³ was the highest amongst the three critical appraisals but their appraisal also had the lowest mean quality score in domain 5 (applicability) at 14%. Despite some differences between the three critical appraisals, there were some similarities. Domain 5 had the lowest mean quality domain scores in all three critical appraisals, followed by domain 6 (editorial independence).

The higher mean quality domain scores in nearly all six domains that we found in our critical appraisal may be attributed to the different raters using the AGREE II¹⁰¹ instrument to evaluate the CPGs. Even though the online AGREE II¹⁰¹ instrument provided details on where to look for the information specific to an item, some suggestions on how to score items and examples of well written statements, a measure of subjectivity existed. We speculated that previous experience using the AGREE II¹⁰¹ tool to appraise CPGs, level of education, current employment setting, research experience, guideline development experience and gender were all factors that may have influenced the differences in quality domain scores observed among all three critical appraisals.

Secondly, it is likely that the quality of development and reporting of CPGs have improved in recent years since the critical appraisals were conducted by Brosseau et al⁴³ and Nelson et al,⁶⁷ which resulted in our appraisal obtaining higher mean quality domain scores. For instance, we compared an older³⁶ and more recent⁵⁶ version of a CPG for people with hip and knee OA developed by the RACGP. The 2018⁵⁶ version of the RACGP clinical practice guideline included four resources to compliment the main guideline: 1) a technical document 2) an administrative document 3) a communication, implementation and dissemination document and 4) a public consultation document. The inclusion of these four reports provided us with more

in-depth documentation that we could refer to when using the AGREE II¹⁰¹ to evaluate the quality of the CPG. We had thorough information on the methodological process, who was involved in the development of the CPG and their roles, the public consultation process, funding sources, declaration of conflicts of interests, plans for dissemination and monitoring the uptake of the recommendations found in the 2018 CPG. We speculate that having access to these four supportive documents to compliment the main CPG, may have contributed to the 2018 RACGP⁵⁶ guideline obtaining higher quality domain scores, which ultimately influenced the overall mean quality domain scores when all CPGs we assessed were considered together.

Lastly, we used the social cognitive theory (SCT)⁷⁹ to explain a third reason why our critical appraisal may have had higher mean quality domain scores versus the other two critical appraisals. As SCT⁷⁹ states, knowledge is acquired through the direct observation of social models or vicariously through the observation of a social model. Conducting a critical appraisal of a CPG provides the opportunity for guideline developers to learn how effectively they developed a CPG. Specifically, guideline developers receive feedback about how they conducted and reported the development process. Based on this feedback from the CPG appraisal, the guideline developers can determine what needs to be improved upon. When the guideline developers update their guideline, they can incorporate this feedback into the development process with the aim of improving the quality of the guideline. Even if a guideline was not previously evaluated in a critical appraisal, guideline developers can read through the published critical appraisals to learn where other guidelines excelled or fell short, and then attempt to incorporate this newly acquired knowledge into the development of their guidelines. We suspect that another reason our critical appraisal obtained higher overall mean quality domain scores was that we were evaluating newer versions of some of the CPGs. Therefore, the guideline

developers of the CPGs that were included in our critical appraisal may have learnt how to develop higher quality guidelines based on previously published critical appraisals.

9.1.3 Discrepancy between overall quality and high-quality CPG scores

As we examined the overall quality scores of each CPG and compared them with the CPGs we deemed were high-quality, we discovered some discrepancies. The six^{53,54,56-58,62} high quality CPGs as determined by our pre-established criteria (Table 2) did not coincide with the top six overall guideline scores as calculated with the AGREE II¹⁰¹ instrument (Figure 1). For instance, the first Ottawa Panel⁵⁸ CPG specific to mind-body exercise did effectively address four domains and one of them was domain 3 (rigour of development) as such it was deemed high quality. However, it was given an overall guideline score of 58%, which was in the bottom five. The second Ottawa Panel⁵⁹ CPG specific to aerobic exercise was not deemed high quality and had an overall score of 67%. This overall score was the same as the EULAR⁵⁷ CPG overall score and the EULAR⁵⁷ CPG was deemed high quality. Lastly, the third Ottawa Panel⁶⁰ CPG, which was specific to aerobic exercise did not effectively address four domains, as such it was not deemed high quality, but it was given an overall guideline score of 75%. This overall guideline score was in the top five (Figure 1).

We examined the individual domain scores of the second and third Ottawa Panel CPGs to determine how far scores were from the > 60% threshold required to be deemed effectively addressed. We found that the second Ottawa Panel⁵⁹ CPG for aerobic exercise had one domain (domain 3: rigour of development) that scored 60% and missed meeting our criteria of being effectively addressed by 1% (Table1). If domain 3 in the second Ottawa Panel⁵⁹ CPG scored above 60%, it would have been deemed high-quality because at least four domains would have

been effectively addressed. Thus, would it have been a high-quality CPG as per our criteria and had a high overall quality score as per the AGREE II¹⁰¹ instrument.

The third Ottawa Panel⁶⁰ CPG for strengthening exercise effectively addressed two domains. Domain 3 (rigour of development) missed being effectively addressed by 2%. However, no other domain score was close to being considered effectively addressed in this CPG. Thus, we felt confident the criterion we established appropriately categorized the third Ottawa Panel CPG for strengthening exercise as lower quality. It is our opinion that the higher overall quality score for the third Ottawa Panel⁶⁰ CPG as calculated by the AGREE II,¹⁰¹ may not be a true reflection of the quality of the guideline.

This discrepancy between highest quality CPGs and the overall quality CPGs scores surprised us because we thought that a guideline deemed higher-quality as determined by our pre-established criteria would have also possessed an overall higher quality guideline score as determined by the AGREE II.¹⁰¹ One explanation for this discrepancy may be related to the order in which we appraised the CPGs. The Ottawa Panel⁵⁸ guideline for mind-body exercise was the first guideline we evaluated in our critical appraisal. It is possible that when each evaluator used the AGREE II¹⁰¹ to provide an overall guideline score, they held this CPG to a higher standard because it was the first CPG appraised, hence the lower overall CPG score. As the critical appraisal progressed and the evaluators assessed more CPGs, a better sense of overall guideline quality was conceptualized. As such, the remaining Ottawa Panel CPGs were given higher overall quality scores.

9.1.4 Differences between interrater reliability scores

Both ourselves and Brosseau et al⁴³ calculated the intraclass correlation coefficient (ICC) estimates to measure interrater reliability of the six domain scores between each evaluator involved in the critical appraisal. Our ICC scores ranged from poor to high (Table 3), whereas the ICC scores as determined by Brosseau et al⁴³ were either good or high. We had better ICC scores in domain 1 (scope and purpose) and 3 (rigour of development), whereas Brosseau et al⁴³ had better ICC scores in domain 2 (stakeholder involvement), 4 (applicability) and 6 (editorial independence). Both ourselves and Brosseau et al⁴³ had high ICC scores in domain 5 (applicability).

One reason we may have had lower ICC scores in three domains, is the type of statistical analysis we conducted with SPSS 25. Our critical appraisal of the 10 CPGs was split amongst three different evaluators. Only one evaluator (BT), appraised all CPGs. The remaining two evaluators split the appraising responsibilities between themselves. Because we had three different raters evaluate the CPGs we chose a one-way random effects model. This statistical model was chosen because the evaluators were not consistent across all CPGs. “One-way” effects refer to the fact that the statistical model does not try to disengage the effects of the evaluator and CPGs.¹¹⁴ As a result, the variances between the same raters’ scores do not even out in the end. Brosseau et al⁴³ chose a two-way random effects model, in which the variances between the raters’ scores even out in the end.¹¹⁴ The ICC scores in a one-way random effects model tend to be lower than other ICC models used,¹¹⁴ including the one chosen by Brosseau et al.⁴³ Using the one-way random effects model to determine interrater reliability may have contributed to the lower ICC scores we found in domain 2 (stakeholder involvement), 4 (clarity of presentation) and 6 (editorial independence).

As previously stated, our analyses resulted in one poor ICC score for domain 4 (clarity of presentation). The ICC score for domain 4 was 0.34 in our study but it was 0.86 (good) in the study conducted by Brosseau et al.⁴³ When we examined the raw scores from each CPG for domain 4 between our evaluators, we discovered there seemed to be more range in the domain scores between the evaluators. For instance, there was a difference of at least three points in the domain scores in five CPGs. Furthermore, one CPG had a difference of five points between the two evaluator domain scores. This difference between domain scores may have resulted because one evaluator overlooked information pertaining to an item in domain 4 while appraising the guideline. It wasn't until the evaluators met, compared and discussed their domain scores that the evaluator realised she inadvertently scored an item incorrectly because she lacked all the information about that item. We speculate that the spread of variability in the domain scores between our two evaluators may have contributed to our interrater reliability assessment exhibiting a poor reliability rating in domain 4.

9.1.5 Comparing the recommendations within the clinical practice guidelines

As we previously stated in the results, there were many consistencies amongst the recommendations that were included in the 10 CPGs that we critically appraised. Individualized, patient-centered care that incorporated education, exercise and weight-management advice were a few of these similarities. However, at times the CPGs lacked clarity regarding precise details about the recommendations included in the CPGs.

While all CPGs recommended exercise as one treatment for knee OA, rarely was specific guidance about exercise dose discussed by the guidelines. Only two guidelines offered details regarding exercise prescription parameters. The CPG developed by EULAR⁵⁷ for individuals

with either an inflammatory arthritis or osteoarthritis, suggested that these individuals follow general physical activity recommendations like those developed by the American College of Sports Medicine (ACSM).¹¹⁵ This physical activity guideline for adults recommends regular, moderate to vigorous aerobic activity lasting 20-30 minutes most days of the week. People who are unable to sustain prolonged periods of aerobic physical activity can participate in shorter, but more frequent bouts of aerobic activity to achieve health benefits. Lastly, the ACSM guideline for adults recommends strengthening exercises twice a week, 2 sets of 8-15 repetitions at a light to moderate intensity. The guideline developed by PANLAR⁶¹ provided a specific recommendation for aerobic physical activity only. They recommended aerobic activity be completed 2-3 times a week, for a duration of 20-30 minutes per bout, be implemented gradually and progressively according to the tolerance of the individual.

Clinical practice guidelines developed for other musculoskeletal conditions such as low back pain,¹¹⁶ osteoporosis¹¹⁷ and knee pain,¹¹⁸ all included recommendations for physical activity or exercise, however none of them provided specific physical activity prescription details. These guidelines discussed the rationale for incorporating physical activity as part of the treatment approach and even highlighted specific types of physical activity to be included. But none of these guidelines provided specific parameters regarding the intensity, frequency, duration, sets or repetitions for the exercises. For instance, the CPG for low back pain published in the Journal of Orthopedic & Sports Physical Therapy, recommended that healthcare practitioners include lumbar coordination, strength, endurance, repeated movements, flexion and nerve mobilization exercises to help individuals recover from their injury.¹¹⁶ However, no specific exercise prescription details related to frequency, duration, number of sets or repetitions are included with this recommendation CPG.

It may have been difficult for the CPGs we appraised to make specific recommendations pertaining to exercise dosage because there were differences between the included studies which informed the exercise recommendations. For instance, there were variations in study design, study participants and parameters of the studied interventions. In the guideline developed by Brosseau et al,⁵⁹ 26 studies were utilized as evidence which informed the recommendation that strengthening exercises be included as a non-pharmacological intervention to improve pain, quality of life and physical function in people with knee OA. Closer examination of those studies demonstrated that many differences were present between them including duration of the strengthening program, type of muscle contraction that was focused on, types of exercises, intensity of exercises, sets, repetitions, mode of delivery and equipment used. With such differences between the evidence, one can appreciate the difficulty in writing a specific exercise recommendation. Furthermore, as Brosseau et al⁵⁹ argued, a specific exercise dose may not be the most important factor in terms of recommending exercise. Rather, they suggested the pertinent message is that individuals with knee OA be encouraged to participate in an exercise program that is performed regularly and consistently for an indefinite period.

In addition to some recommendations lacking clarity about exercise dose, we also found that there were discrepancies in some of the recommendations between the guidelines. For example, there were differences in the recommendations specific to the utilization of adjunct interventions like interferential current (IFC), ultrasound and acupuncture. Higher quality guidelines provided recommendations against some adjunct interventions or provided neutral recommendations. Whereas, the lower quality guidelines only provided recommendations in favor of certain adjunct interventions. The RACGP⁵⁶ guideline, which was highly rated, recommended against the use of IFC, ultrasound and acupuncture. They justified these

recommendations because the evidence suggested that the studies about these interventions were low quality, highly biased, had sampling issues, the effects were no better than placebo or sham treatment and if there were effects, they were short lived.⁵⁶ The guideline developed by NICE,⁵³ which was also a high quality guideline, recommended the use of IFC but not acupuncture and did not provide a recommendation for ultrasound. The guideline developed by TLAR,⁵⁵ one of the lowest rated CPGs, recommended the use of IFC and ultrasound. This recommendation was based on one randomized controlled trial (RCT) but no evidence tables were included in this guideline. As such, how the evidence from this RCT was evaluated is left unexplained. TLAR⁵⁵ based the ultrasound recommendation on two RCTs, but again, no evidence tables were included in the guideline so the transparency in which the evidence was evaluated should be questioned.

Both the OARSI⁵⁴ and VA/DoD⁶² guidelines included neutral recommendations regarding acupuncture. A neutral recommendation was provided when the guideline developers were not able to provide a direction about the recommendation i.e. either for it or against it. The guideline developers have left the decision to offer acupuncture as a treatment for people with knee OA, up to the healthcare practitioner and the individual with knee OA. OARSI⁵⁴ included an evaluation of the evidence surrounding acupuncture use and admitted it appeared there were few clinically relevant statistical differences between acupuncture and sham acupuncture. The VA/DoD⁶² did not include any reference to the evidence regarding acupuncture in their guideline at all. We find it somewhat surprising to read two neutral recommendations from higher rated CPGs for an intervention which the guideline developers admitted had little evidence to support its use or did not comment on the evidence to support its use. While the guideline developers who voted on the recommendations are expected to remain impartial during this procedure, we are left to wonder if individual bias played a role in acupuncture obtaining the recommendation it

did in both the OARSI⁵⁴ and VA/DoD⁶² guidelines particularly when the evidence suggested this intervention lacked effectiveness and efficacy.

9.1.6 Strengths of the critical appraisal

Using both the knowledge-to-action (KTA)⁷⁶ theoretical framework and the social cognitive theory (SCT)⁷⁹ to inform this research project are one of the main strengths of the overall study. We used the KTA⁷⁶ framework to guide the planning of this research project. The two main phases of the KTA⁷⁶ framework, knowledge creation and knowledge action, are distinct components. Despite this, they are intricately woven together. The development of CPGs, which are tools used to disseminate specific healthcare knowledge, are formed during the knowledge creation phase of the KTA⁷⁶ framework. They are the final product of the knowledge inquiry and knowledge synthesis stages in the knowledge creation phase. Numerous clinical practice guidelines, which provide advice regarding healthcare management specific to people with knee OA, have been developed and updated over the years. We decided to assess the quality of the CPGs prior to moving into the action phase of the KTA⁷⁶ framework. This way, we could determine the highest quality CPGs that we would use as benchmarks for comparison with the clinical practice of physiotherapists who work in Canada. Once we completed the critical appraisal, we would transition into the action cycle where we would determine if a gap between knowledge and practice exists and determine some beliefs physiotherapists have about CPGs.

A second strength of our study was that prior to beginning the critical appraisal, we decided that the evaluators would complete online training in the use of the AGREE II¹⁰¹ tool. This was an opportunity for the evaluators to become familiar with the AGREE II¹⁰¹ and to acquire knowledge about how to use the tool appropriately to assess the quality of CPGs. The

online training also provided the opportunity to practice using the AGREE II¹⁰¹ on a CPG. Once completed, the evaluators compared their scores to each other and discussed why they scored items as they did. It provided the chance to learn more about the scoring and adapt scoring behavior based on new knowledge that was acquired. The evaluators also discussed the strengths and challenges of the tool and problem solved through any issues that would potentially arise with its use. As such, having had the opportunity to practice with the AGREE II,¹⁰¹ discuss the use of the tool and observe the outcomes of each others' behaviors in using the AGREE II,¹⁰¹ ensured the evaluators were competent in its use prior to beginning the critical appraisal of the 10 CPGs.

9.1.7 Limitations of the critical appraisal

A first limitation of our critical appraisal is the influence of scoring bias. All three evaluators were trained physiotherapists who have earned higher levels of education and have research experience. They are all employed in an academic setting, at an influential post-secondary institution. They live and work in a westernized culture, in a country that has a strong economic outlook and is well respected through-out the world. It would be an oversight not to recognize how these factors may have unintentionally influenced the quality scores of the CPGs and ultimately which CPGs were found to be higher quality than others.

A second limitation of our critical appraisal is affiliated with the AGREE II¹⁰¹ instrument. The use of the AGREE II¹⁰¹ requires at least two evaluators to appraise one CPG. We speculate that needing two evaluators to use the tool may contribute to logistical challenges when using it. For example, deciding who appraises the CPGs; which CPGs each evaluator will rate; setting expectations of when CPGs are appraised by and establishing opportunity to discuss the

appraisals may be barriers to its use in a variety of settings. Furthermore, using the AGREE II¹⁰¹ instrument to assess CPGs takes time. Based on anecdotal feedback from our appraisers, a minimum of two hours had to be dedicated to evaluating a CPG. While two hours seemed to be the minimum, more than often, three to four hours was required for the appraisals.

The use of the AGREE II¹⁰¹ in specific situations, like a physiotherapy department or physiotherapy clinic, may be limited because two people are needed to appropriately use the tool and because it takes time to appraise CPGs with it. Having worked clinically for over ten years in both the public and private sector, physiotherapists were rarely afforded the opportunity to devote direct patient care time to other clinical endeavors. It may be challenging to obtain consent from a senior manager, supervisor or clinic owner to use the resources of two clinicians to assess the quality of a CPG with the AGREE II¹⁰¹ instrument.

9.1.8 Future research directions

We believe an instrument to evaluate the quality of CPGs is valuable because it will help end-users make decisions about which CPGs they can trust to meet their needs. While the AGREE II¹⁰¹ instrument was time consuming to use, it was helpful in appraising the quality of CPGs. The Global Rating Scale (GRS)¹¹⁹ is a guideline assessment tool that is based on the AGREE II¹⁰¹ instrument and was developed for use by researchers, clinicians, guideline developers and policy makers who have time constraints and limited resources. Like the AGREE II,¹⁰¹ a minimum of two evaluators is still needed to use the GRS¹¹⁹ to rate quality statements on a 7-point Likert scale and the evaluators assign an overall guideline assessment score. However, unlike the AGREE II,¹⁰¹ there are only four statements to rate using the GRS.¹¹⁹ This tool has been shown to be a useful instrument that provides a quick evaluation of CPGs. Future research

to confirm the validity and reliability of the GRS¹¹⁹ will strengthen the trust in the measurement capability of this tool, potentially making it more appealing for use by stakeholders who cannot dedicate the time and resources to evaluating CPGs that the AGREE II demands.

Even though the core recommendations in the CPGs for individuals with knee OA have suitable evidence demonstrating they improve patient outcomes; what is lacking is a clear link between the CPGs and patient outcomes. Without this link, it can be much harder to convince clinicians about the value and the role of CPGs in guiding care when treating people with knee OA. We suggest that research which investigates the differences in patient outcomes between healthcare practitioners who follow a certain CPG for individuals with knee OA, versus those healthcare practitioners that do not follow the CPG will provide evidence that CPGs do in fact improve patient outcomes. Establishing this evidence may influence the utilization of CPGs in healthcare settings.

9.2 Survey and vignette

9.2.1 Summary

The aims of the online survey and vignette were to establish the self-reported clinical practice of physiotherapists who treat people with knee OA in Canada; gather demographic data on the respondents; investigate physiotherapists' awareness of CPGs; whether respondents followed CPGs; beliefs and confidence specific to CPGs for knee OA and barriers and facilitators to CPG utilization. A total of 388 physiotherapists who worked in Canada completed the survey and vignette (Figure 2). Most of the respondents identified as female, were between the ages of 30-39 and were employed in private practices in urban settings (Table 6). Nearly all the respondents provided education and strengthening exercises, whereas aerobic exercise and weight-management were less frequently prescribed interventions (Figure 3). Stretching and

active range of motion exercises were the most frequently prescribed adjunct interventions and orthotics was the least prescribed (Figure 4). Benefits of exercise was the most frequently discussed education topic and weight-loss advice was the least discussed (Figure 5).

Of the 388 respondents, 271 respondents were aware of CPGs and 253 respondents reported they followed CPGs. Respondents agreed that both barriers and facilitators existed to using CPGs in practice (Figure 10). Confidence in finding and time to search for CPGs were reported as barriers by a larger number of respondents (Figure 11). Accessibility to the internet and a supportive work environment were the top reported facilitators to CPG use (Figure 12).

Between the physiotherapists who reported they followed CPGs and those who did not/did not answer the question, aerobic exercise, thermotherapy and exercise dose advice, demonstrated a statistically significant difference. Furthermore, beliefs about whether CPGs enhanced decision making, improved patient care, patient outcomes and were encouraged at work, demonstrated statistically significant differences between physiotherapists who reported they did follow and did not/did not answer follow CPGs. Likewise, confidence in finding; interpreting and critically appraising CPGs demonstrated statistically significant differences between the two groups of physiotherapists (Table 11). Between the two groups of physiotherapists, those who followed CPGs and those who did not/did not answer the question, there was statistically significant differences whether they believed barriers and facilitators to CPG use existed.

Physiotherapists who reported their primary employment setting was in the hospital were less likely to prescribe aerobic exercise to people with knee OA compared to those employed in settings categorized as “other”. As well, physiotherapists who had an MPT degree were more likely to discuss weight-management compared to physiotherapists with had earned an MSc degree. Lastly, physiotherapists who reported they had taken a post-graduate course related to

knee OA were more likely to discuss weight-management with people who have knee OA compared to those who had not taken a post-graduate course related to OA.

9.2.2 Comparing the clinical practice of physiotherapists who treat people with knee OA

When we compared our research to previously published data on the clinical practice of physiotherapists who treat individuals with knee OA, we found both similarities and differences. Surveys were most commonly used to report on the clinical practice of physiotherapists who treated people with knee OA.^{35,83-88} As well, convenience sampling was the most commonly used method to obtain a population of physiotherapists eligible to complete the survey.^{84-86,88} Two studies from the United Kingdom^{83,87} and one from the Netherlands⁸⁹ used random sampling. Response rates from other studies that examined the clinical practice of physiotherapists ranged from 3%⁸⁴ to 67%.⁸⁵ It is difficult to estimate our response rate as we cannot confirm with certainty how many physiotherapists received our invitation to participate in the survey and how many physiotherapists were eligible to complete the survey. We theorized that approximately 13,000 physiotherapists could have received the invitation to participate in our survey. A total of 388 physiotherapists completed our survey, which is similar to da Costa et al⁸⁴ who had 413 physiotherapists complete their survey. Otherwise, the number of physiotherapists who participated in studies that examined their clinical practice when treating people with knee OA, range from 83 physiotherapists in the study by Walsh et al,⁸⁷ up to 1152 in the study by Holden et al.⁹⁰ Other participation rates were in the mid to high 200s.^{85,86,88,89} Studies that had higher response rates and participation rates used random sampling methods,^{83,87} relied on a national organization to assist with recruitment,^{83,87} and used various methods to remind physiotherapists to complete the survey.⁸⁵

In terms of demographics, the majority of respondents were female in our study (76%), which was similar to the studies by Holden et al⁸³ (87%), da Costa et al⁸⁴ (64%) and Peter et al⁸⁹ (64%). Males made up the majority of respondents in the remainder of the studies.^{85,86,88} As well, the studies conducted by Holden et al,⁸³ Walsh et al⁸⁷ and Ayanniyi et al⁸⁵ found the majority of respondents worked in the public sector, 77%, 94% and 96% respectfully. This differs from our study which indicated most respondents worked in private practice (64%) as compared to the public sector (36%). The method of recruitment is a reasonable explanation for these differences as both Walsh et al⁸⁷ and Ayanniyi et al⁸⁵ distributed their surveys to physiotherapy departments in hospital based settings only, which are typically publicly funded. In terms of length of years practicing, there were similarities in the surveys that asked this question. Approximately 60% of the respondents in our study had practiced for 10 years or more, as did those in the study by da Costa et al⁸⁴ (66%), Ayanniyi et al⁸⁵ (58%) and Peter et al⁸⁹ (63%). Lastly, 41% of respondents in our survey completed a post-graduate course specific to knee OA, compared to 24% in the study by Holden et al⁸³ and 29% in the study by da Costa et al.⁸⁴

According to nearly all CPGs we appraised, education was a core intervention that should be provided to individuals with knee OA. Aligned with this, the majority of physiotherapists who have responded to surveys asking them about their clinical practice, including ours, reported they included education as part of the treatment.^{83,84,86,88,89} One hundred percent of the physiotherapists in the study by Holden et al⁸³ provided education to patients, which was the highest frequency reported in the studies we reviewed. Walsh et al⁸⁷ reported that 65% of respondents provided education and Ayanniyi et al⁸⁵ only reported on weight-management advice, but not other types of education. It was surprising to see a lower percent of physiotherapists who prescribed education in the study by Walsh et al⁸⁷ compared to the other

studies. Education is a fundamental component of physiotherapy management when people with various health conditions seek out the expertise of a physiotherapist. The manner in which this question was asked in the survey by Walsh et al,⁸⁷ the fact their sample size was small (83/300 physiotherapists completed the survey) and because the survey only included physiotherapists who worked in the public sector only, may have contributed to the lower percent of physiotherapists who discussed education in their study.

Consistent with CPGs that recommended exercise be prescribed to all people with knee OA, the physiotherapists who participated in the studies examining their clinical practice when treating people with knee OA, prescribed therapeutic exercise nearly 100%^{83,84,86,88,89} or 100%⁸⁷ of the time. This was consistent with our study in which 96% of respondents prescribed some type of exercise for people with knee OA. The only exception to this finding was in the study conducted by Ayanniyi et al⁸⁵ where findings showed 81% of physiotherapists prescribed therapeutic exercise as part of the treatment for people with knee OA. Strengthening exercises were the most commonly reported exercise prescribed by physiotherapists in some of the studies including ours.^{83,86,88,89} The studies by Walsh et al,⁸⁷ da Costa et al⁸⁴ and Ayanniyi et al⁸⁵ did not differentiate the types of therapeutic exercise prescribed, so no specific data about strengthening exercise or aerobic exercise are available. In addition to our study, Holden et al,⁸³ Spitaels et al⁸⁸ and Peter et al⁸⁹ also reported on aerobic exercise for people with knee OA. Peter et al⁸⁹ reported that 80% of their respondents prescribed aerobic exercise. Spitaels et al⁸⁸ found that 77% of their respondents prescribed aerobic exercise, compared to 60% of our respondents and 9% of the respondents in the study by Holden et al.⁸³ Aerobic exercise is a core exercise intervention recommended by some of the CPGs for people with knee OA, but it is not consistently recommended across all the guidelines. The study by Holden et al⁸³ was published in 2008,

whereas the study by Peter et al⁸⁹ was published in 2013, the study by Spitaels et al⁸⁸ was published in 2016, and our study was completed in 2018. This may explain why the percentage of respondents prescribing aerobic exercise was much lower in the study by Holden et al.⁸³ It could be that the importance of aerobic exercise for people with knee OA is emphasized more frequently now when training physiotherapists on the best interventions to offer people with knee OA than it was in the mid to late 2000's. Furthermore, access to healthcare/physiotherapy journals may be more widely available nowadays. This may have influenced the higher percent of physiotherapists who reported utilizing aerobic exercise in the more recent studies.

Weight-management advice was the last core intervention recommended by nearly all the CPGs that we appraised. However, it was the least reported intervention in the studies conducted. In addition to our study, Spitaels et al,⁸⁸ Jamtvedt et al⁸⁶ and Ayanniyi et al⁸⁵ were the other studies to ask if physiotherapists discussed weight-management with people they were treating for knee OA. Data from all four studies were similar. In our study, 56% of respondents stated they discussed weight-loss. In the studies completed by Spitaels et al⁸⁸ and Ayanniyi et al,⁸⁵ 49% of physiotherapists discussed weight-loss and 58% of physiotherapists discussed weight-loss in the study by Jamtvedt et al.⁸⁶ Research has demonstrated that weight-loss can improve physical disability,⁹⁷ decrease knee pain,¹²⁰ lessen compressive forces on the knee joint¹²⁰ and improve inflammatory markers¹²⁰ in individuals with knee OA. If there are reported benefits to weight-loss in individuals who are over-weight or obese and who have knee OA, why aren't physiotherapists discussing it more frequently?

Unlike education and exercise, it may be that physiotherapists are not as comfortable offering advice pertaining to weight-management. Perhaps our physiotherapy training does not provide us with the skills to have these conversations with people, especially since weight can be

a sensitive topic to discuss. Without the appropriate training to have these conversations about weight-loss, there is a risk that physiotherapists may stigmatize individuals they are treating. Previous research demonstrated that physiotherapists held negative attitudes towards individuals who were overweight or obese.^{121,122} As well, physiotherapists assumed that weight was individually controlled, and related to what people ate or their exercise habits, rather than recognizing that weight management is a complex interaction related to endocrine, metabolic and genetic factors.¹²¹ More importantly, individuals who were over-weight or obese reported they were able to discern when they were experiencing negative attitudes from physiotherapists because of their weight.¹²³ The impacts of these negative attitudes resulted in individuals not seeking medical care,¹²⁴ not committing to physical activity,^{122,123} experiencing depression,¹²⁵ anxiety,¹²⁵ low self-esteem,¹²¹ or maladaptive eating behaviors.¹²¹ While physiotherapists may be well placed to discuss weight-loss during their interactions with individuals with knee OA, we encourage physiotherapists to reflect on whether they hold biases towards over-weight and obese individuals and recognize the potential impact of these biases on their interactions with clients.

With regards to the adjunct non-pharmacological interventions, there were some consistencies across all the studies. Manual therapy, i.e. joint mobilizations or manipulations was consistently prescribed by physiotherapists across the studies. In the study conducted by Ayanniyi et al,⁸⁵ physiotherapists included manual therapy 76% of the time, which was higher than the other studies. Most physiotherapists in the other studies, including ours, reported using manual therapy between 36% to 60% of the time.^{67,83,84} Electrotherapy was another consistently used adjunct treatment. Respondents in the survey conducted by Walsh et al⁸⁷ had the highest reported use of electrotherapy at 66%, followed by 57% of respondents in the study by Ayanniyi et al.⁸⁵ A total of 36% respondents in our study reported using electrotherapy which was similar

to Holden et al.⁸³ Both da Costa et al⁸⁴ and Jamtvedt et al⁸⁶ reported low rates of use at 16% and 12% respectfully. When studies asked about acupuncture use, it ranged from 0%⁸⁶ to 64%.⁸⁷ Physiotherapists in our study reported they used acupuncture 39% of the time. While adjunct interventions do not make up the foundation of non-pharmacological treatment that should be offered to people with knee OA, only a couple guidelines provided strongly worded recommendations against some of the adjunct treatments.^{53,56} Many of the guidelines suggested that the adjunct treatments may be used in combination with the core interventions and left the decision about incorporating the use of this type of treatment up to the healthcare professional and patient.

9.2.3 Reasons why aerobic exercise was not included as frequently as strengthening exercise

Physiotherapists are primary healthcare professionals that work in collaboration with individuals to promote physical activity, restore mobility and maximize independent optimal function across the lifespan.¹⁰⁰ Providing education and prescribing exercise are fundamental components of physiotherapy care that help individuals who have a disease, disorder or injury achieve their fullest physical and mental potential.¹⁰⁰ Consequently, it was not surprising to find that education and leg strengthening exercises were the most commonly prescribed interventions, but it was somewhat surprising aerobic exercise was not prescribed more. There are a couple of possible reasons why physiotherapists may not prescribe aerobic exercise as frequently as education and strengthening exercise when treating people with knee OA. One reason maybe related to physiotherapists own personal health behaviors.

Research has demonstrated that health professionals who engage in physical activity themselves are more likely to recommend and discuss the benefits of physical activity with their

patients.¹²⁶⁻¹²⁸ The rates of physiotherapists engaging in physical activity has been shown to be variable among different populations of physiotherapists.^{129,130} Research conducted in Canada using accelerometers to measure the physical activity levels of physiotherapists practicing in British Columbia indicated that 58% of the study participants met the recommended requirement of 150 minutes of moderate-to-vigorous physical activity in bouts of 10 minutes or more per week.¹³⁰ In contrast, a study conducted in physiotherapy students in Saskatchewan who also wore accelerometers, found that 26% of the participants met the recommended requirement of 150 minutes of moderate-to-vigorous physical activity in bouts of 10 minutes or more per week.¹²⁹ Research that has examined the physical activity levels of physiotherapists practicing in the United Kingdom¹³¹ was not much higher than the rates of the physiotherapy students studied in Canada. In the study completed by Lowe et al,¹³¹ physical activity was measured by self-report via a survey and discovered that 38% of physiotherapists practicing in the United Kingdom met physical activity guidelines. If physiotherapists themselves do not participate in regular aerobic physical activity, they may not counsel the individuals they treat to participate in this activity.

A second explanation for why aerobic exercise was not prescribed as frequently as education and strengthening exercises may be related to knowledge pertaining to the recommended levels of physical activity. It has been shown that physiotherapists and physiotherapy students believe they should be giving advice regarding physical activity to their patients and they are confident in their ability to provide this advice.¹³² However, when questioned about specific details regarding what the physical activity recommendations included, very few physiotherapists were able to answer questions about specific details regarding the physical activity recommendations.^{131,132} As such, we speculate that another reason why

physiotherapists did not discuss aerobic exercise as frequently with individuals who have knee OA, is because they were not familiar with physical activity guidelines specific to aerobic exercise.

9.2.4 Physiotherapists' ideas about clinical practice guidelines

A significant proportion of the respondents did not answer the question of whether they followed CPGs for people with knee OA. We suspect this may have occurred because respondents could only answer on a Likert scale from, “always to never” and did not have the option to choose “I do not know”. Furthermore, when we examined the answers for individuals who stated they did not know if CPGs existed, each one of those individuals left the question about following CPGs blank. We believe this further supports our theory that those who left the question pertaining to following CPGs blank, did not know if they followed CPGs because they did not know what was in the CPGs.

With regards to beliefs and confidence associated with CPGs, the results from our study are similar to what has been previously published about the uptake of evidence-based practice (EBP) by physiotherapists.^{44,78,133} Nearly 80% of the physiotherapists in the research conducted by Jette et al⁷⁸ and Bernhardsson et al⁴⁴ believed EBP enhanced decision making which was on par with the 85% of respondents in our study. As well, 79% of the respondents in the study by Jette et al⁷⁸ believed EBP improved the quality of care compared to 82% of our respondents. Respondents in our study reported they were more confident in their search skills compared to other studies but they were only marginally more confident.^{44,78}

Consistent with previously published research specific to EBP,^{44,78,133,134} our research demonstrated that time to search for CPGs is a common barrier reported by physiotherapists in

utilizing CPGs in clinical practice. Furthermore, lack of confidence in search skills and ability to appraise EBP or CPGs were common barriers reported in our study and in the study by Jette et al.⁷⁸ A much higher percent of respondents in our study reported that a lack of interest was a barrier to CPG use as compared to research conducted by Bernhardsson et al.⁴⁴ Our study and the study conducted by Bernhardsson et al.⁴⁴ examined CPG use by physiotherapists and were conducted only a few years apart. One possible reason for this difference between the two studies maybe related to the fact that our question about barriers was specific to CPGs for knee OA whereas Bernhardsson et al.⁴⁴ was asking about barriers related to the use of any CPGs. Lastly, consistent with the systematic review conducted by Condon et al.¹³⁴ and the study by Jette et al,⁷⁸ we also found that organizational or a supportive employment environment was an important facilitator to CPG use.

9.2.5 Does it matter if physiotherapists follow clinical practice guidelines?

Even though education, exercise and weight-management advice constitute the first line of treatments recommended by CPGs, and that CPGs are often touted as tools that should be used to improve patient outcomes, improve quality of care and enhance decision making, little evidence exists to substantiate these claims in OA care.¹³⁵ In contrast, adherence to CPGs developed for low-back have demonstrated an improvement in clinical outcomes such as pain,¹³⁶ physical function^{137,138} and disability.^{137,138} Furthermore, adherence to CPGs for low-back pain resulted in fewer physiotherapy visits,¹³⁶ decreased healthcare costs¹³⁸ and better patient satisfaction.¹³⁸ Our study indicated there were very few differences in interventions prescribed between the respondents who reported they followed or did not follow CPGs. Furthermore, since to the best of our knowledge no studies have demonstrated that following CPGs for people with knee OA results in improved clinical outcomes, we suggest that whether physiotherapists follow

CPGs for people with knee OA is not the pressing issue pertaining to knee OA care. Instead, we propose that there is an inconsistency or a gap in the healthcare that is delivered to individuals with knee OA and this is an important issue that should be acknowledged. According to our research, this gap may not be explicit to the care delivered by physiotherapists, but other research has indicated that the healthcare people with knee OA have stated they received is contradictory to the care that medical professionals have stated they provided to individuals with knee OA.^{139–145} As such, it is worth drawing the attention of physiotherapists to this discrepancy so physiotherapists realize that the care people with knee OA have reported they received is not consistent across healthcare professions.

To begin with, research that has asked people with knee OA about the care they received from healthcare professionals has shown that the core interventions of education, exercise and weight-management advice are not consistently recommended or prescribed.^{139,140,143–145} Li et al¹³⁹ found that in people with knee and hip OA, exercise and education were prescribed 25% of the time by healthcare professionals. Furthermore, additional studies found that education was discussed between 40%^{140,144} and 81%¹⁴⁵ of the time depending on the type of education.¹⁴³ Advice to lose weight was discussed 42%¹⁴⁵ and 46%¹⁴³ of the time.

In addition to asking people to report on the care they received, chart reviews provide another method to evaluate if healthcare professionals are offering care consistent with evidence-based medicine. Chart reviews that have examined the extent to which healthcare professionals recommended the core interventions for OA care have found that education was documented as being discussed 28.6%¹⁴² to 30%¹⁴¹ of the time. Furthermore, exercise was discussed 58.1% of the time, with leg strengthening and aerobic exercise being recommended 40% and 18.1% of the time.¹⁴² These findings are much lower than what we found with our survey and what has been

published in other studies that have examined the clinical practice of physiotherapists treating people with knee OA.⁸³⁻⁸⁵

While we propose there may be gaps in the care people with knee OA have stated they received and the care that medical professionals stated they offered, we need to acknowledge there may be other factors contributing to this perceived gap in care. To begin with, it is important to recognize how both social desirability bias and recall bias can influence study findings. Social desirability bias occurs when individuals conform to an item, such as a specific behavior, because it is perceived that is the appropriate way to behave.¹⁴⁶ It includes presenting oneself in the best possible light¹⁴⁷ and making a socially favorable response.¹⁴⁶ Thus social desirability bias warns us that the responses physiotherapists provided about their clinical practice may be a reflection of how they thought researchers wanted them to answer questions and not a reflection of their true clinical practice. Recall bias is an inaccuracy when remembering events or experiences that have occurred in an individual's life.¹⁴⁸ In the context we are discussing, people with knee OA who were asked to recall their care with medical professionals, may not accurately recall or remember the precise details pertaining to that care. We feel these biases may partially explain the discrepancies in OA care discovered in research conducted with people with knee OA and healthcare professionals.

Secondly, many of the studies that asked patients about their experiences receiving OA care, inquired about medical care but not specifically physiotherapy treatment. As such, we should be cautious in assuming the reports from people with knee OA not getting care consistent with core interventions included care offered by physiotherapists. Lastly, the chart reviews conducted were not of physiotherapists. Rather, the chart reviews investigated the OA care offered by general physicians and rheumatologists.^{141,142}

Because of these contributing factors, we should be wary in assuming these gaps in OA care exist in physiotherapy for they maybe a reflection of healthcare in general. Despite this, we encourage physiotherapists to take notice of these discrepancies. We can use this information as an opportunity to reflect on our own individual practice when treating people with knee OA to ensure we are providing care that is evidence based, patient centered, individualized and consistently providing interventions that are the core foundations of knee OA care.

9.2.6 Strengths of the survey and clinical vignette

One of the strengths of our survey was that we used both the SCT⁸⁰ and the KTA⁷⁶ framework to guide the development of the survey. Specifically, they helped to inform the types of questions we asked on our survey (Appendix 3). For instance, in the domain of cognition/knowledge, we asked questions about the highest level of education achieved and whether physiotherapists had taken a post-graduate course related to knee OA. These questions were underpinned by both the SCT⁸⁰ and KTA⁷⁶ framework. Likewise, questions related to behavior of physiotherapists specific to the types of interventions provided to an individual with knee OA and the education discussed with someone with knee OA were informed by both the SCT⁷⁹ and KTA⁷⁶ framework. Questions pertaining to beliefs about the consequences and outcome expectancies related to using CPGs and whether their use improves the quality of patient care, improves patient outcomes or enhances decision making, were influenced by the SCT.⁸⁰ This theory also informed the questions related to self-efficacy such as confidence finding, interpreting and critically appraising CPGs.

Use of the SCT⁸⁰ and KTA⁷⁶ framework also helped us decide which independent variables to include in the statistical analysis. We focused on variables that could be categorized into cognition/knowledge, personal characteristics or the environment. Furthermore, when we

ran into challenges with our statistical analysis, as we did when we determined it was ill-suited to conduct binomial logistic regression for to determine factors associated with physiotherapists who followed CPGs, we referred to the SCT⁸⁰ and KTA⁷⁶ framework. By using both in this circumstance, we were guided on how to determine the more appropriate logistic regression analyses to conduct.

A second strength of our survey was that we enlisted six physiotherapists to conduct pilot testing. We aimed to ensure comprehensiveness, clarity and readability of the vignette and survey questions. Furthermore, pilot testing allowed us to determine the approximate time required to complete the survey. Modifications in wording, order of questions and the types of questions asked were made to the survey based on the feedback. The goal of the pilot testing was to trust we developed a vignette and survey that was user-friendly and realistic thus increasing the likelihood of respondents completing our survey.

A third strength of our survey was that we utilized multiple strategies to recruit physiotherapists to participate in our study. Our first recruitment approach was to target physiotherapists registered with the Canadian Physiotherapy Association (CPA). The CPA is a national body and includes membership from physiotherapists practicing in nearly all provinces and territories. However, membership in the CPA is voluntary. Knowing that we might miss recruiting physiotherapists who were not a part of the CPA, we collaborated with British Columbia, Alberta, Ontario and Manitoba on an individual level to recruit physiotherapists practicing in those provinces to participate in our survey. We did not enlist the assistance of all regulatory bodies because some of them reported they would not circulate the survey to their members or it was not financially possible for us to utilize them. Lastly, we used social media to recruit physiotherapists to complete our survey. Social media is a unique platform to engage,¹⁴⁹

interact¹⁴⁹ and collaborate¹⁵⁰ with a target population. The content of the message shared on social media can be tailored to the target population and there are numerous ways to present the information.¹⁵⁰ Recognizing social media was a unique platform to engage with our population, we used Twitter to share details of our study with a variety of physiotherapists practicing in Canada and physiotherapy representative groups. Approximately 10 tweets were sent from the primary investigator's personal twitter account over four weeks, from mid-November 2018 until mid-December 2018. Approximately 5000 impressions were experienced due to these tweets. Impressions refer to the number of times the tweet was seen, retweeted, shared or commented on. Unfortunately, we are unable to confirm how many physiotherapists completed the survey because they were recruited via Twitter. Despite this, we feel it was a valuable recruitment avenue to pursue because it fostered positive physiotherapy interactions on social media, connected us as researchers to potential end-users of our research and allied us with the broader physiotherapy community.

9.2.7 Limitations of the survey and clinical vignette

The first limitation to our study was that we decided to conduct data imputation to account for missing data instead of deleting the cases. We felt that we may lose information valuable to our study if we completely deleted cases. Conducting data imputation results in a trade-off. While we were able to keep cases in our study, we risked underestimating the variance, compromising the relationships between variables and imparting bias when we were summarizing our results.¹⁰⁹ The overall result of these risks was that data imputation may have distorted the study findings.¹⁵¹ Independent variables pertaining to demographic data and whether physiotherapists prescribed aerobic exercise, leg strengthening and weight-loss advice,

showed the lowest percent of data that was missing in our study. Age, length practicing, and leg strengthening were missing 0.5% of data i.e. two responses per variable. Gender, highest level of education, primary employment setting, aerobic exercise and weight-loss advice were missing 0.3% of data i.e. one response per variable. The independent variables that related to beliefs about CPGs and confidence finding, interpreting and appraising CPGs, were missing between 3.6% to 4.0% of data i.e. 14-16 responses per variable. While these percentage of missing data per variables were low, we should still be cautious when interpreting our study findings.

A second limitation of our study is the lack of respondents from various parts of Canada. We had no respondents from Nunavut or the Yukon Territory and only two respondents from the Northwest Territories. Furthermore, we had five respondents from Quebec and four from Saskatchewan. The implications of very few respondents from the territories and specific provinces means that our study does lack some generalizability. We should question how representative our results are of physiotherapists who practice in Canada. Without having appropriately weighted data from all provinces and territories, we really do not know how physiotherapists are practicing clinically when treating people with knee OA in these areas. As such, we need to be clear and explicit about who we are referring to when we discuss and describe the clinical practice of physiotherapists who work in Canada.

A third limitation of the survey component of our study was the influence of social desirability bias, which suggests that respondents in a survey answer questions in a way they think we want them to, as opposed to answering the question with the knowledge they possess.^{146,147} We attempted to thwart this bias by reassuring respondents the survey was anonymous (i.e. that there was no way for us to determine how specific individuals answered the questions) and by providing options to questions they could choose if they did not know the

answer i.e. “I do not know” or “neutral”. Despite these, it is likely social desirability bias did influence our study results, if only to a small extent.

9.2.8 Future research directions

Considering the findings that both aerobic exercise and weight-management advice were the least discussed and prescribed core interventions by the respondents in our survey, future research that explores these findings, specific to the population with knee OA, would be valuable. It would be helpful to understand if physiotherapists who practice in Canada are aware of the benefits of aerobic exercise and weight-loss in people with knee OA and to determine the barriers and facilitators to physiotherapists prescribing these core interventions for people with knee OA.

Furthermore, research that examines the clinical practice of physiotherapists when treating people with knee OA using other research approaches such as chart reviews or standardized patients, may confirm whether discrepancies exist pertaining to the care provided by physiotherapists to people with knee OA. Using additional techniques to help understand the clinical practice of physiotherapists who treat people with knee OA, could clarify if gaps in care exist and provide recommendations to minimize these gaps. Ultimately this would allow physiotherapists to provide care that is consistent with evidence-based recommendations.

10 Conclusion

We conducted this study to: 1) critically appraise CPGs for people with knee OA and summarize the findings pertaining to non-pharmacological interventions found in the CPGs; 2) establish the self-reported clinical practice of physiotherapists working in Canada and

investigate beliefs, confidence, barriers and facilitators specific to CPGs; and 3) compare the clinical practice of physiotherapists to higher quality CPGs to determine the extent to which physiotherapists provide care consistent with non-pharmacological recommendations in the CPGs. There was a range in overall quality of the 10 CPGs, but most had higher overall quality scores. We determined that six CPGs were high quality. The CPG developed by the Royal Australian College of General Practitioners stood out from all the other CPGs because it was transparently developed and well written. Education, exercise and weight-management advice were the non-pharmacological recommendations found in nearly all appraised CPGs. Recommendations for adjunct treatment were not consistent across the CPGs.

Physiotherapists who responded to our survey provided education and strengthening exercises more frequently than aerobic exercise and weight-management advice. Furthermore, they offered adjunct treatments to individuals with knee OA, but the frequency varied depending on the intervention. Prescription of aerobic exercise, thermotherapy and advice regarding exercise dose, demonstrated statistically significant differences between physiotherapists who followed and did not follow CPGs. As well, beliefs about CPGs and confidence in finding, interpreting and appraising CPGs demonstrated statistically significant differences between physiotherapist who reported they did and did not follow CPGs. However, all these associations between the dependent and independent variables were weak. Respondents reported several barriers and facilitators to using CPGs, with more respondents reporting there were barriers versus facilitators. Confidence finding CPGs was the most frequently reported barrier. Accessibility to the internet was the most frequently reported facilitator to utilizing CPGs. Working in a hospital setting decreased the likelihood that a physiotherapist would discuss aerobic exercise with an individual with knee OA compared to

physiotherapists working in “other” settings. Having earned an MPT degree or having taken a post-graduate course related to knee OA, increased the likelihood of discussing weight-management with people with knee OA.

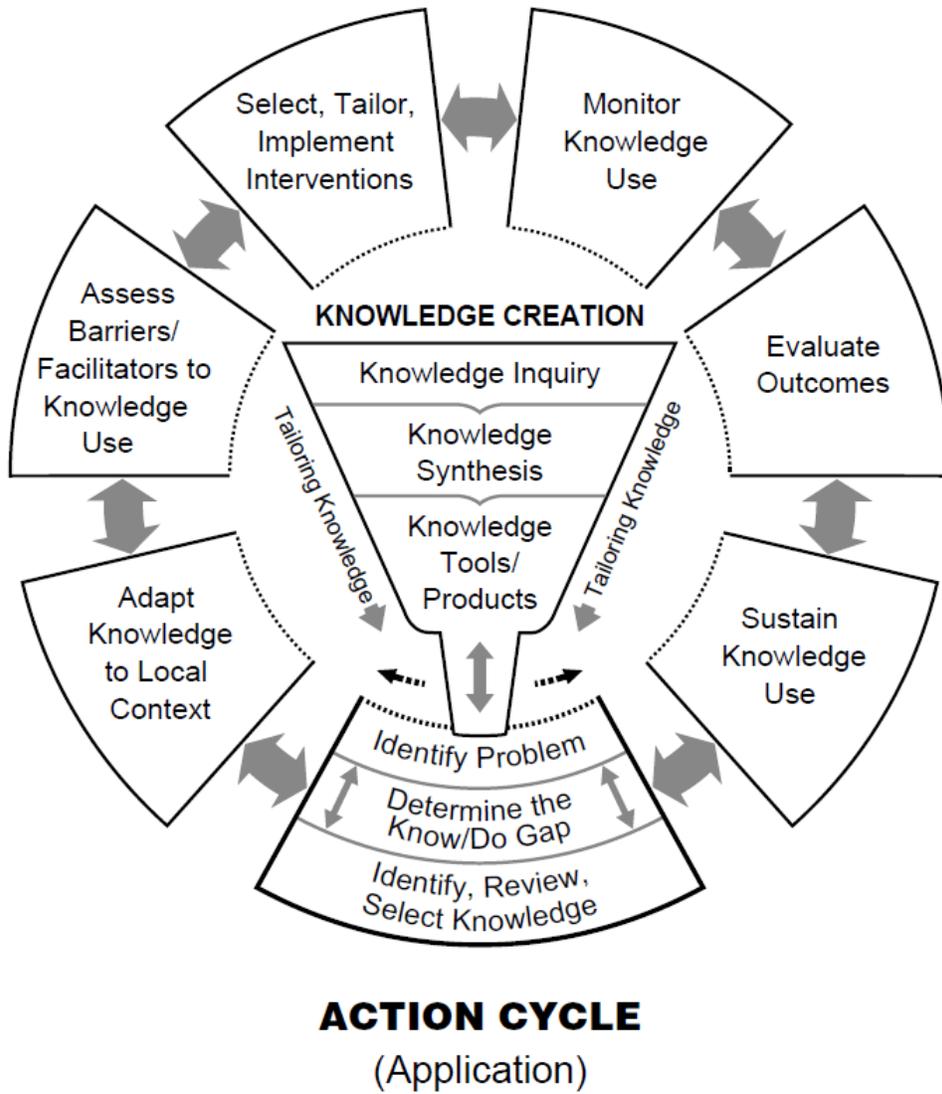
Our study is the first in Canada to exclusively examine the clinical practice of physiotherapists working with individuals who have knee OA. Furthermore, our study demonstrated that the physiotherapists who responded to the survey consistently provided care in line with certain non-pharmacological recommendations in high quality CPGs, such as education and strengthening exercises. However, the results also indicated there are certain aspects of care that the respondents are not providing as frequently, such as aerobic exercise and weight-management advice. We encourage physiotherapists to reflect on their own clinical practice to ensure they are providing OA care consistent with evidence-based research, to help people with knee OA live to their fullest physical potential.

Appendix 1: AGREE II Domains and Items

Domain 1: Scope and Purpose	
Item	Content
1	The overall objective(s) of the guideline is (are) specifically described
2	The health question(s) covered by the guideline is (are) specifically described
3	The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.
Domain 2: Stakeholder Involvement	
Item	Content
4	The guideline development group includes individuals from all relevant professional groups
5	The views and preferences of the target population (patients, public, etc.) have been sought
6	The target users of the guideline are clearly defined
Domain 3: Rigour of Development	
Item	Content
7	Systematic methods were used to search for evidence
8	The criteria for selecting the evidence are clearly described
9	The strengths and limitations of the body of evidence are clearly described
10	The methods for formulating the recommendations are clearly described
11	The health benefits, side effects, and risks have been considered in formulating the recommendations

12	There is an explicit link between the recommendations and the supporting evidence
13	The guideline has been externally reviewed by experts prior to its publication
14	A procedure for updating the guideline is provided
Domain 4: Clarity of Presentation	
Item	Content
15	The recommendations are specific and unambiguous
16	The different options for management of the condition or health issue are clearly presented
17	Key recommendations are easily identifiable
Domain 5: Applicability	
Item	Content
18	The guideline describes facilitators and barriers to its application
19	The guideline provides advice and/or tools on how the recommendations can be put into practice
20	The potential resource implications of applying the recommendations have been considered
21	The guideline presents monitoring and/or auditing criteria
Domain 6: Editorial Independence	
Item	Content
22	The views of the funding body have not influenced the content of the guideline
23	Competing interests of guideline development group members have been recorded and addressed

Appendix 2: Knowledge to Action Cycle



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Appendix 3: Theory/ Framework Informing the Survey Questions

Domains	Questions	Theory/Framework/adapted from
Cognition <ul style="list-style-type: none"> knowledge 	Highest level of education attained	Social Cognitive Theory (SCT) Knowledge to Action Cycle (KTA), Jette ⁷⁸
	Post graduate training related to OA	SCT, KTA
	Awareness of non-pharmacological clinical practice guidelines (CPGs)	SCT, KTA, Jette ⁷⁸ , Bernhardsson ⁴⁴
	How become aware of guidelines	KTA
	Barriers/ facilitators to non-pharmacological CPGs	KTA
Beliefs about Capabilities <ul style="list-style-type: none"> Self-efficacy 	Confident in finding non-pharmacological CPGs	SCT
	Confident in critically appraising and interpreting non-pharmacological CPGs	SCT
	Confident in ability to use non-pharmacological CPGs even when they don't conform to previous learning	SCT, KTA
Beliefs about consequences <ul style="list-style-type: none"> outcome expectancies 	Non-pharmacological CPGs are necessary	SCT, Jette ⁷⁸ , Bernhardsson ⁴⁴
	Non-pharmacological CPGs improve quality of care	SCT, Jette ⁷⁸
	Non-pharmacological CPGs help with decision making	SCT, Jette ⁷⁸ , Bernhardsson ⁴⁴
	Non-pharmacological CPGs improve patient outcomes	SCT
	Incorporate patient preferences with non-pharmacological CPGs	SCT, Jette ⁷⁸ , Bernhardsson ⁴⁴
Environment	Province or territory licensed to practice	SCT, KTA
	Rural versus higher populated centres	SCT, KTA, Jette ⁷⁸
	Type of employment setting	SCT, KTA, Jette ⁷⁸
	Non-pharmacological CPG use at work	SCT, Bernhardsson ⁴⁴
Behavior	Use of non-pharmacological CPGs	SCT
	Interventions offered to people with knee OA	SCT, KTA
	Factors influencing interventions offered	SCT, KTA
	Education provided to people with knee OA	SCT, KTA
	Frequency of individualized care, aerobic activity, strengthening exercise, weight loss	SCT, KTA
	Promoting adherence to exercise	SCT, KTA
Social Influences	Colleagues use non-pharmacological	SCT

Appendix 4: On-line Survey

“Knee OA Survey: Clinical Practice of Canadian Physiotherapists and Beliefs about Clinical Practice Guidelines”

Please fill in the information below.

First three letters of your postal code followed by first three letters of your mother’s maiden name.

Part One: demographic data

Please answer the following questions to determine your eligibility to participate in this study.

- 1) Are you currently licensed to practice physiotherapy in Canada?
 - Yes
 - No

- 2) Does your current caseload include the assessment and treatment of adults (>18 years old) who currently have knee osteoarthritis?
 - Yes
 - No

Please answer the following questions pertaining to demographic data, education and employment setting.

- 1) What province or territory are you licensed to practice physiotherapy?

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland
- Northwest Territories
- Nova Scotia
- Nunavut
- Ontario
- Prince Edward Island
- Quebec
- Saskatchewan
- Yukon

2) What is your gender?

- Female
- Male
- I identify another way
- I prefer not to answer

3) What is your age?

- 20-29 years old
- 30-39 years old
- 40-49 years old
- >50 years old

- 4) How long have you been practicing as a licensed physiotherapist?
- < 5 years
 - 5-10 years
 - 11-15 years
 - > 15 years
- 5) What is your highest level of education attained?
- Diploma
 - Bachelor Degree (BMR-PT, BScPT)
 - Masters Degree (MPT)
 - Masters Degree (MSc)
 - PhD
- 6) What is your primary employment setting?
- Private practice
 - General hospital inpatient
 - General hospital outpatient
 - Rehabilitation facility inpatient
 - Rehabilitation facility outpatient
 - Long-term care facility
 - Community care access centre
 - Home visiting agency
 - Other
- 7) Which best describes the location of your primary employment setting?
- Rural (population less than 1,000)¹⁵²

- Small population centre (population between 1,000- 29,999)¹⁵²
- Medium population centre (population between 30,000- 99,999)¹⁵²
- Large urban population centre (population greater than 100,000)¹⁵²

Part two: clinical practice of Canadian physiotherapists

The following clinical vignette and questions will gather information regarding self-reported assessment and treatment of an individual with knee OA:

A 65-year-old female is referred to physiotherapy by her family physician with a 2-year history of insidious right knee pain that is gradually getting worse. Aside from mild hypertension and being overweight, she is in good health.

At her first physiotherapy appointment with you, she indicates her pain is a 4/10, she describes it as “achy” and she tells you her pain is aggravated with prolonged walking, ascending and descending stairs, squatting down to reach into the bottom cupboard and if she sits with her knee bent for too long. As well, she has stiffness in her right knee in the morning that last for 30-60 minutes. She states she enjoys walking and playing with her grandkids but is frustrated because these tasks are becoming more difficult. She finds a hot bath will sometimes make her knee feel better. Lastly, she has been using an anti-inflammatory cream and is taking 2 ibuprofen pills a day and both help her pain.

On examination, the client walks with a slight limp and has difficulty standing up from her chair due to right knee pain. She has a mild right knee effusion. Her right knee flexion is slightly reduced, and she has weakness in her quadriceps, hamstring and gluteal muscles. Lastly, she has mild medial joint line tenderness.

1) Indicate what interventions would you offer or suggest during her physiotherapy sessions with you i.e. initial visit and subsequent visits. Check all that apply.

- TENS/IFC
- Ultrasound
- Joint mobilizations/ manipulations
- Passive range of motion
- Thermotherapy (heat or ice)
- Acupuncture
- Taping
- Orthotics
- Knee brace
- Local strengthening for quadriceps and hamstring muscles
- Other muscle strengthening
- Aerobic exercise
- Stretches
- ROM exercises
- Education
- Weight management advice
- Gait aid
- Other. Describe _____

2) What factors influence the above interventions you would offer or suggest? Check all that apply.

- Clinical experience
 - Employment setting/ workplace
 - Post graduate training related to knee osteoarthritis
 - Best practice guidelines for managing knee OA
 - What was taught during undergraduate program
 - Other post graduate training i.e. acupuncture, orthopedic levels
 - My colleagues and co-workers
 - The patient
 - Other_____
- 3) Indicate the education would you provide to this individual during her physiotherapy sessions with you i.e. initial and subsequent visits. Check all that apply.
- Pathology/ risk factors of OA
 - Benefits of aerobic, strengthening, ROM, stretching or other exercises
 - Exercise dose
 - Strategies to self- manage pain
 - When to stop exercises because of pain
 - When to keep exercising despite pain
 - Pain science education i.e. what is pain, hurt versus harm
 - Reassurance it is safe to exercise despite knee OA
 - Weight management advice
 - Other_____
- 4) When treating an individual with knee OA, how often do you provide individualized care?

- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 5) When treating an individual with knee OA, how often do you provide education?
- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 6) When treating an individual with knee OA, how often do you prescribe aerobic exercise?
- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 7) When treating an individual with knee OA, how often do you prescribe leg strengthening exercises?
- Never
 - Rarely
 - Sometimes

- Most of the time
 - Always
- 8) When treating an individual with knee OA who is overweight or obese, how often do you discuss weight loss?
- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 9) When treating an individual with knee OA, how often do you discuss strategies to promote adherence to exercises?
- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 9a) Describe the strategies to promote adherence to exercise that you use. I.e. goal setting, exercise log book etc.
- 10) How often do you suggest an individual with knee OA seek out information from organizations such as the Arthritis Society of Canada or other agencies that help people who have been diagnosed with knee OA?

- Never
- Rarely
- Sometimes
- Most of the time
- Always

11) Have you completed post-graduate training related to knee osteoarthritis?

- Yes
- No

11a) Describe the training. I.e. course, conference, webinar etc.

Part three: The following section asks questions about clinical practice guidelines, which are systematic statements derived from evidence that assist in healthcare decision making.⁴⁰

1) Non-pharmacological clinical practice guidelines for individuals with knee OA exist.

- Yes
- No
- Do not know

1a) If yes, how did you become aware of these guidelines? (check all that apply)

- While in physiotherapy school
- Graduate training
- Post- graduate physiotherapy course
- Colleagues
- Conferences

- Webinars/ Podcasts
 - Social Media such as Facebook, Twitter, Instagram, YouTube
 - Online (Google, guideline website)
 - Medical/healthcare/physiotherapy journal
 - Other
- 2) I follow non-pharmacological clinical practice guidelines when treating individuals with knee OA.
- Never
 - Rarely
 - Sometimes
 - Most of the time
 - Always
- 3) Using non-pharmacological clinical practice guidelines for individuals with knee OA are necessary in physiotherapy.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
- 4) Non-pharmacological clinical practice guidelines for individuals with knee OA improve the quality of patient care.
- Strongly disagree
 - Disagree

- Neutral
 - Agree
 - Strongly agree
- 5) Non-pharmacological clinical practice guidelines for individuals with knee OA help me make decisions about patient care.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
- 6) Non-pharmacological clinical practice guidelines for individuals with knee OA improve patient outcomes.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
- 7) I can incorporate patient preferences with non-pharmacological clinical practice guidelines.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree

- Strongly agree
- 8) I am confident in my ability to find relevant non-pharmacological clinical practice guidelines.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
- 9) I am confident in my ability to critically appraise non-pharmacological clinical practice guidelines.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree
- 10) I am confident in my ability to interpret non-pharmacological clinical practice guidelines.
- Strongly disagree
 - Disagree
 - Neutral
 - Agree
 - Strongly agree

11) I am confident in my ability to utilize non-pharmacological clinical practice guidelines even if they do not conform to how I was originally taught to assess and treat people with knee OA.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

12) Using non-pharmacological clinical practice guidelines for people with knee OA are encouraged at my workplace.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

13) My physiotherapy colleagues use non-pharmacological clinical practice guidelines for people with knee OA.

- Yes
- No
- Do not know

14) Barriers to utilizing non-pharmacological clinical practice guidelines exist.

- Yes
- No

- Do not know

14a) If yes, please check either “yes” or “no” the barriers to utilizing non-pharmacological clinical practice guidelines. You can check more than one item.

- Lack of time
- Lack of accessibility
- Unsure where or how to look for guidelines
- Organizational/ employment culture (support from employer and colleagues to use guidelines)
- Lack of generalizability of clinical practice guidelines
- Unable to apply clinical practice guidelines to individual patients
- Unsure how to critically appraise clinical practice guidelines
- Lack of interest
- Other

15) Facilitators to using non-pharmacological clinical practice guidelines exist.

- Yes
- No
- Do not know

15a) If yes, check either “yes” or “no” the facilitators to using non-pharmacological clinical practice guidelines. You can check more than one item.

- Accessibility to internet (work and/ or home)
- Organizational/ employment culture (support from employer and colleagues to use guidelines)
- Confidence in ability to search for guidelines

- Confidence in ability to critically appraise and interpret guidelines
- Social media (Facebook, Twitter, Instagram, YouTube)
- Other

Appendix 5: Individual AGREE II Item Scores: Raw and Adjusted

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
EULAR	Scope and Purpose	1	5	6
	Scope and Purpose	2	7	7
	Scope and Purpose	3	5	6
	Stakeholder Involvement	4	6	6
	Stakeholder Involvement	5	6 (5)	4 (5)
	Stakeholder Involvement	6	6	6
	Rigour of Development	7	6	6
	Rigour of Development	8	5	6
	Rigour of Development	9	5	6
	Rigour of Development	10	6	7
	Rigour of Development	11	7 (6)	5 (6)
	Rigour of Development	12	7	6
	Rigour of Development	13	2	2
	Rigour of Development	14	1	1
	Clarity of Presentation	15	7	5 (6)
	Clarity of Presentation	16	4	4
	Clarity of Presentation	17	7	6
	Applicability	18	4	5
	Applicability	19	1 (2)	5 (2)
	Applicability	20	4 (3)	2 (3)
	Applicability	21	1	1
	Editorial Independence	22	1 (2)	3
	Editorial Independence	23	2	4 (2)
	Overall Assessment	OA1	5	5
	Overall Assessment	OA2	Yes	Yes

EULAR: European League Against Rheumatism, OA: overall assessment. Number in brackets denotes adjusted item score.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
NICE: GC177	Scope and Purpose	1	7	6
	Scope and Purpose	2	7	7
	Scope and Purpose	3	7	7
	Stakeholder Involvement	4	5	6
	Stakeholder Involvement	5	6	7
	Stakeholder Involvement	6	5	6
	Rigour of Development	7	7	7
	Rigour of Development	8	6	7
	Rigour of Development	9	7	7

	Rigour of Development	10	5	6
	Rigour of Development	11	5	6
	Rigour of Development	12	6	7
	Rigour of Development	13	6	7
	Rigour of Development	14	4	5
	Clarity of Presentation	15	5	6
	Clarity of Presentation	16	6	6
	Clarity of Presentation	17	6	6
	Applicability	18	4 (3)	2 (3)
	Applicability	19	5	5
	Applicability	20	6	6
	Applicability	21	5	5
	Editorial Independence	22	4	4
	Editorial Independence	23	7	7
	Overall Assessment	OA1	6	6
	Overall Assessment	OA2	Yes	Yes

NICE: National Institute for Health and Care Excellence, CG: clinical guideline, OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 3
OARSI	Scope and Purpose	1	7	7
	Scope and Purpose	2	4	6 (5)
	Scope and Purpose	3	6	7
	Stakeholder Involvement	4	7	6
	Stakeholder Involvement	5	6	5
	Stakeholder Involvement	6	7 (6)	5 (6)
	Rigour of Development	7	5	6
	Rigour of Development	8	5	5
	Rigour of Development	9	7	6
	Rigour of Development	10	7	7
	Rigour of Development	11	7	7
	Rigour of Development	12	7	7
	Rigour of Development	13	4 (2)	2 (3)
	Rigour of Development	14	1	1
	Clarity of Presentation	15	7 (6)	5
	Clarity of Presentation	16	7	6
	Clarity of Presentation	17	7	6
	Applicability	18	2	2
	Applicability	19	1	2
	Applicability	20	1	2
	Applicability	21	1	1
	Editorial Independence	22	7	6

	Editorial Independence	23	7	7
	Overall Assessment	OA1	6	6
	Overall Assessment	OA2	Yes	Yes

OARSI: Osteoarthritis Research Society International, OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 1	Appraiser 3
Ottawa Panel #1	Scope and Purpose	1	6	6
	Scope and Purpose	2	6	7
	Scope and Purpose	3	4	5
	Stakeholder Involvement	4	6	7
	Stakeholder Involvement	5	3	7 (4)
	Stakeholder Involvement	6	5	7 (6)
	Rigour of Development	7	7	7
	Rigour of Development	8	5	4
	Rigour of Development	9	6	7
	Rigour of Development	10	6	7
	Rigour of Development	11	5	4
	Rigour of Development	12	6	7
	Rigour of Development	13	6 (1)	1
	Rigour of Development	14	1	1
	Clarity of Presentation	15	6	7
	Clarity of Presentation	16	4	7 (4)
	Clarity of Presentation	17	7	7
	Applicability	18	1	1
	Applicability	19	2	1
	Applicability	20	2	1
	Applicability	21	2	1
	Editorial Independence	22	2 (3)	4 (3)
	Editorial Independence	23	1 (2)	4 (3)
	Overall Assessment	OA1	5	4
	Overall Assessment	OA2	Yes	Yes

OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
Ottawa Panel #2	Scope and Purpose	1	6	7
	Scope and Purpose	2	7	7
	Scope and Purpose	3	4	3
	Stakeholder Involvement	4	7	6
	Stakeholder Involvement	5	3	3
	Stakeholder Involvement	6	5	5

	Rigour of Development	7	7	7
	Rigour of Development	8	4	5
	Rigour of Development	9	6	5
	Rigour of Development	10	7	6
	Rigour of Development	11	4 (5)	6 (4)
	Rigour of Development	12	7	6
	Rigour of Development	13	1	2
	Rigour of Development	14	1	1
	Clarity of Presentation	15	7	6
	Clarity of Presentation	16	5	6
	Clarity of Presentation	17	6	7
	Applicability	18	4 (5)	6
	Applicability	19	1	2
	Applicability	20	1	2
	Applicability	21	1	2
	Editorial Independence	22	3	3
	Editorial Independence	23	3	3
	Overall Assessment	OA1	5	5
	Overall Assessment	OA2	Yes	Yes

OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
Ottawa Panel #3	Scope and Purpose	1	5	6
	Scope and Purpose	2	7	6
	Scope and Purpose	3	5	4
	Stakeholder Involvement	4	7 (5)	5
	Stakeholder Involvement	5	3	2
	Stakeholder Involvement	6	5	4
	Rigour of Development	7	7	7
	Rigour of Development	8	4	5
	Rigour of Development	9	7	6
	Rigour of Development	10	5	5
	Rigour of Development	11	4	5
	Rigour of Development	12	7	6
	Rigour of Development	13	1	2
	Rigour of Development	14	1	1
	Clarity of Presentation	15	6	5
	Clarity of Presentation	16	5	4
	Clarity of Presentation	17	7	7
	Applicability	18	1	2
	Applicability	19	2	2
	Applicability	20	1	2

	Applicability	21	1	2
	Editorial Independence	22	3	3
	Editorial Independence	23	3	2
	Overall Assessment	OA1	5	6
	Overall Assessment	OA2	Yes	Yes

OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 4	Appraiser 3
PANLAR	Scope and Purpose	1	6	6
	Scope and Purpose	2	4	4
	Scope and Purpose	3	5	4
	Stakeholder Involvement	4	4	4
	Stakeholder Involvement	5	5	5
	Stakeholder Involvement	6	3	4
	Rigour of Development	7	3	6 (4)
	Rigour of Development	8	1 (2)	3 (2)
	Rigour of Development	9	3	3
	Rigour of Development	10	5	6
	Rigour of Development	11	2	5 (4)
	Rigour of Development	12	7 (5)	4
	Rigour of Development	13	1	1
	Rigour of Development	14	1	1
	Clarity of Presentation	15	6 (5)	3 (4)
	Clarity of Presentation	16	7	5
	Clarity of Presentation	17	6	6
	Applicability	18	1 (3)	4 (3)
	Applicability	19	1	2
	Applicability	20	1	4
	Applicability	21	1	2
	Editorial Independence	22	4	2
	Editorial Independence	23	4	1 (3)
	Overall Assessment	OA1	3	4
	Overall Assessment	OA2	No	Yes with modifications

PANLAR: Pan- America League of Associations against Rheumatism, OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
RACPG	Scope and Purpose	1	7	7
	Scope and Purpose	2	7	7
	Scope and Purpose	3	7	7

	Stakeholder Involvement	4	7	7
	Stakeholder Involvement	5	6	7
	Stakeholder Involvement	6	7	6
	Rigour of Development	7	7	7
	Rigour of Development	8	7	7
	Rigour of Development	9	7	7
	Rigour of Development	10	6	7
	Rigour of Development	11	7	7
	Rigour of Development	12	7	7
	Rigour of Development	13	6	7
	Rigour of Development	14	3 (4)	5 (4)
	Clarity of Presentation	15	7	7
	Clarity of Presentation	16	7	7
	Clarity of Presentation	17	7	7
	Applicability	18	7	6
	Applicability	19	4 (7)	7
	Applicability	20	7 (6)	5
	Applicability	21	4 (5)	7 (5)
	Editorial Independence	22	5	5
	Editorial Independence	23	7	7
	Overall Assessment	OA1	7	7
	Overall Assessment	OA2	Yes	Yes

RACGP: Royal Australian College of General Practitioners, OA: overall assessment. Numbers in bracket denotes adjusted item scores.

Appraisal Title	Section	Item	Appraiser 2	Appraiser 1
TLAR	Scope and Purpose	1	5	5
	Scope and Purpose	2	4	5
	Scope and Purpose	3	7	6
	Stakeholder Involvement	4	1	1
	Stakeholder Involvement	5	1	1
	Stakeholder Involvement	6	6	5
	Rigour of Development	7	6	5
	Rigour of Development	8	4	4
	Rigour of Development	9	4 (3)	2 (3)
	Rigour of Development	10	5	4
	Rigour of Development	11	4	5
	Rigour of Development	12	5	5
	Rigour of Development	13	1	1
	Rigour of Development	14	1	2
	Clarity of Presentation	15	5	4

	Clarity of Presentation	16	7	6
	Clarity of Presentation	17	6	5
	Applicability	18	2	1
	Applicability	19	1	2
	Applicability	20	3	1 (3)
	Applicability	21	2	3
	Editorial Independence	22	1	2
	Editorial Independence	23	3	4
	Overall Assessment	OA1	4	3
	Overall Assessment	OA2	No	No

TLAR: Turkish League Against Rheumatism, OA: overall assessment, Numbers in brackets denote adjusted item scores.

Appraisal Title	Section	Item	Appraiser 1	Appraiser 2
VA/DoD	Scope and Purpose	1	7	7
	Scope and Purpose	2	7	7
	Scope and Purpose	3	7	7
	Stakeholder Involvement	4	5 (6)	7
	Stakeholder Involvement	5	1 (5)	7 (5)
	Stakeholder Involvement	6	5 (6)	7
	Rigour of Development	7	7	7
	Rigour of Development	8	7	7
	Rigour of Development	9	7	7
	Rigour of Development	10	3 (5)	7 (6)
	Rigour of Development	11	7	7
	Rigour of Development	12	7	6
	Rigour of Development	13	3 (5)	7 (6)
	Rigour of Development	14	6	7
	Clarity of Presentation	15	7	7
	Clarity of Presentation	16	7	7
	Clarity of Presentation	17	7	7
	Applicability	18	2	2
	Applicability	19	5	4
	Applicability	20	3	2
	Applicability	21	1	2
	Editorial Independence	22	1	3 (2)
	Editorial Independence	23	2 (3)	6 (4)
	Overall Assessment	OA1	6	6
	Overall Assessment	OA2	Yes	Yes

VA/Dod: Veterans Affairs/ Department of Defense, OA: overall assessment. Numbers in brackets denote adjusted item scores.

Appendix 6: Online Survey Consent Disclosure Statement

Knee Osteoarthritis: An Exploration of the Current State of Clinical Practice amongst Canadian Physiotherapists and their Beliefs about Utilizing Clinical Practice Guidelines”

Online Survey Consent Disclosure Statement

Invitation to participate

You are being invited to participate in this survey because you are a Canadian physiotherapist. My name is Brenda Tittlemier. I am conducting this survey as a requirement for my MSc thesis at the University of Manitoba.

Your participation in this survey is voluntary. Participating will not produce any advantages or disadvantages to you. This is an anonymous survey. The survey system will not record your email or IP address.

Purpose of the study

This study will ask questions about treating people with knee osteoarthritis (OA), with the aim of determining the self-reported state of physiotherapy clinical practice in Canada offered to people with knee OA. As well, this study will investigate beliefs about non-pharmacological clinical practice guidelines for people with knee OA. The survey will be open for four weeks.

Procedures for participation

If you consent to participate in this survey, you will click on the “next” button at the bottom of this screen which begins the survey. You will be asked to create a unique indirect identifier at the start of the survey. This indirect identifier will not include information that the principal investigators can use to identify who you are. It is linked to your survey responses and the investigators will use it to ensure the survey is completed only one time by each respondent. This survey will take you approximately 10-15 minutes to complete. The survey system cannot save your responses, so the survey must be completed in one sitting. You can end your participation in the survey at any time. If you begin the survey and decide not to participate, simply exit the survey.

Participant incentive

At the end of the survey, you can choose to enter a draw to win 1 of 3 \$50 gift certificates from Mountain Equipment Co-op. You will be re-directed to a Google form which will ask you to fill in your name, email and mailing address. The personal information you provide on the Google form cannot be linked to your survey responses. You must answer a skill testing question correctly to be eligible to win a gift certificate. The personal information you provide on this form will be accessible by the co-investigators only and will be kept on a password protected

computer. All information will be deleted/shredded once the gift certificates are received by the winners.

Benefits or risks to participating

Assisting in establishing the current state of Canadian physiotherapy practice when treating individuals with knee OA and identifying if gaps between practice guidelines and clinical practice exist. This may influence future research initiatives and education.

There are no known risks to participating if participants do not to enter the draw to win a gift certificate. If participants enter the draw to win a gift certificate, there may be a risk of breach of privacy as investigators will be required to print out a hard copy of the contact information form to draw winners for the gift certificates.

Investigator contact details

Brenda Tittlemier, BMR(PT), MSc Candidate: umtittle@myumanitoba.ca

Sandra Webber, PhD, MSc, BMR(PT): Sandra.webber@umanitoba.ca

College of Rehabilitation Sciences, University of Manitoba

204-787-1099

Funding has been provided by the Physiotherapy Association of Manitoba.

This study and survey has been approved by the Health Research Ethics Board at the University of Manitoba.

By clicking on the “next” button, you are consenting to participate in the survey.

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