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Review

A Systematic Review of Clinical Practice Guidelines for Physical Therapist Management of Patellofemoral Pain

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Abstract

Objective. The purpose of this study was to conduct a systematic review to evaluate clinical practice guidelines for the physical therapist management of patellofemoral pain.

Methods. Five electronic databases (CINAHL, Embase, Medline, Psychinfo, Cochrane Library) were searched from January 2013 to October 2019. Additional search methods included searching websites that publish clinical practice guidelines containing recommendations for physical therapist management of patellofemoral pain. Characteristics of the guidelines were extracted, including recommendations for examination, interventions, and evaluation applicable to physical therapist practice. Quality assessment was conducted using the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument, applicability of recommendations to physical therapist practice was examined using the AGREE Recommendation Excellence instrument, and convergence of recommendations across guidelines was assessed.

Results. Four clinical practice guidelines were included. One guideline evaluated as higher quality provided the most clinically applicable set of recommendations for examination, interventions, and evaluation processes to assess the effectiveness of interventions. Guideline-recommended interventions were consistent for exercise therapy, foot orthoses, patellar taping, patient education, and combined interventions and did not recommend the use of electrotherapeutic modalities. Two guidelines evaluated as higher quality did not recommend using manual therapy (in isolation), dry needling, and patellar bracing.

Conclusion. Recommendations from higher-quality clinical practice guidelines may conflict with routine physical therapist management of patellofemoral pain. This review provides guidance for clinicians to deliver high-value physical therapist management of patellofemoral pain.

Impact. This review addresses an important gap between evidence and practice in the physical therapist management of patellofemoral pain.

Lay Summary. If you have kneecap pain, this review offers guidance for your physical therapist to provide examination processes, treatments, and evaluation processes that are recommended by high-quality guidelines.

Keywords: Systematic Review, Clinical Guidelines, Patellofemoral Pain Syndrome

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Introduction

Patellofemoral pain is a common musculoskeletal condition with an estimated prevalence of between 23% and 29% in adult and adolescent populations.[1] Pain around or behind the patella that restricts activities, including stair mobility, squatting, jogging, and sitting, are the predominant clinical features.[2] These symptoms and activity limitations may be influenced by multiple factors, including the presence of psychological features (eg, anxiety, depression, and pain-related fear),[3] and clinical features such as muscular or biomechanical impairments.[4] Of those with patellofemoral pain, 1 in 2 adults may be at risk of persistent symptoms for 5 to 8 years,[5] and 20% to 30% of adults have shown radiological signs of patellofemoral osteoarthritis.[6] Given the high prevalence and burden of the condition, it is imperative that physical therapists provide the highest value management for their patients.

Clinical practice guidelines assist with clinical decision making and optimize clinical outcomes through the provision of appropriate high-quality care and reduction of inappropriate low-value care.[7] Clinical practice guidelines include recommendations on examination, interventions, and evaluation for specific conditions. The recommendations are based on both a systematic review of the best available evidence as well as a consensus from an expert panel regarding the interpretation of the evidence and consideration of the benefit versus the harm or burden of the recommended health intervention.[8,9] The recent evidence of a wide variation in physical therapist management for patellofemoral pain in a range of physical therapy settings suggests there is uncertainty regarding the optimal physical therapist management of patellofemoral pain.[10]

To optimize care for people with patellofemoral pain, physical therapist management should be guided by high-quality (trustworthy) clinical practice guidelines that include recommendations that are applicable to physical therapist practice and will result in clinical benefits important to their patients.[11] The Appraisal of Guidelines for Research and Evaluation (AGREE II) instrument is the benchmark for assessing trustworthiness of clinical practice guidelines.[12] To be trustworthy, a clinical practice guideline should include research questions that are specifically described, based on a systematic review of the evidence, developed by a multidisciplinary panel of experts with the participant group, provide recommendations that are specific and unambiguous, describe barriers and facilitators to application, and report any competing interest of the developers. The AGREE II can be used in conjunction with the Appraisal of Guidelines for Research and Evaluation Recommendation Excellence (AGREE-REX) instrument to evaluate if the recommendations from clinical practice guidelines are clinically applicable to physical therapist practice.[11,13]

Recent systematic reviews of clinical practice guidelines for common musculoskeletal conditions have raised concerns about trustworthiness of clinical practice guidelines with substantial variation in quality.[14] In 1 systematic review, 26 of 34 clinical practice guidelines for musculoskeletal conditions (76%), including 1 clinical practice guideline for patellofemoral pain,[15] were rated as low quality using the AGREE II instrument.[14] In another systematic review of clinical practice guidelines for management of anterior cruciate ligament injuries, 2 of the 6 clinical practice guidelines (33%) were rated as low quality using the AGREE II instrument.[16] The main quality concerns from both systematic reviews were related to the domain "applicability," with clinical practice guidelines commonly lacking details and strategies to enhance uptake of recommended interventions in clinical practice. These systematic reviews reinforce the notion of the imperative to critically appraise and evaluate the quality of a clinical practice guideline before adopting recommendations into clinical practice. To date, no systematic reviews appraising the quality of clinical practice guidelines to guide physical therapist practice for the management of people with patellofemoral pain have been located.

Therefore, the primary aims of this review were to evaluate (1) the quality of the clinical practice guidelines for physical therapist management of patellofemoral pain, (2) the clinical applicability of recommendations for physical therapist management of patellofemoral pain, and (3) the convergence of recommendations across guidelines for physical therapist management of patellofemoral pain. Hence, with calls for the adoption of care consistent with guidelines in musculoskeletal physical therapy,[17] this review will inform and support the delivery of evidence-based high-value physical therapist management of patellofemoral pain.

Methods

A systematic review of clinical practice guidelines was conducted. The review was reported consistent with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[18]

Data Sources and Searches

Five electronic data bases (CINAHL, Embase, Medline, Psychinfo, Cochrane Library) were searched from January 2013 until October 2019 to identify clinical practice guidelines reflective of current practice.[9] The search strategy involved 2 key concepts: patellofemoral pain and clinical practice guidelines. For each concept, key words and medical subject headings were combined using the "OR" operator and the results were combined using the "AND" operator. An example of the search in 1 database can be viewed in the Supplementary Table.

The search results were downloaded into bibliographic software (Endnote V.18). Two authors independently reviewed the titles and abstracts yielded according to the selection criteria (Tab. 1). If a title or abstract indicated that a clinical practice guideline was eligible for inclusion or there was uncertainty based on title and abstract, a full-text version was obtained. The 2 review authors then independently assessed the full-text version to determine if the guideline met the inclusion criteria. To find additional relevant published guidelines, reference lists of selected articles were manually searched, and citation tracking of selected guidelines was applied using Google Scholar. Additional search methods included searching organizations and websites that publish clinical practice guidelines relevant to physical therapist practice (orthoguidelines.org, clinicalguidelines.gov.au, g-i-n.net/library/international-guidelines-library, nice.org.uk/guidance, sign.ac.uk/our-guidelines.html, guideline.gov, ptnow.org/clinical-practice-guidelines). Reference lists from previous systematic review papers of existing clinical practice guidelines for musculoskeletal conditions were also screened to identify any additional papers not initially identified. Finally, the authors and an experienced researcher in patellofemoral pain were asked to review the

Table 1. Selection Criteria

	Inclusion Criteria	Exclusion Criteria
Design and report	Clinical practice guideline included systematic methods to acquire evidence date of publication since 2013	Non-English language were systematic reviews, editorials, or abstracts only
Participants	Clinical practice guideline included recommendations for managing patellofemoral pain. Clinical practice guidelines could include other participants provided recommendations for patellofemoral pain were reported separately	Clinical practice guideline included participants with other conditions only, such as knee osteoarthritis or anterior cruciate ligament injury
Management	Clinical practice guideline included at least 1 recommendation relevant to physical therapist practice	

search results to identify any additional guidelines not initially identified.

Study Selection

Clinical practice guidelines containing recommendations for physical therapist management of patellofemoral pain were included. Clinical practice guidelines for management of people with other conditions only, such as anterior cruciate ligament injury, were excluded (Tab. 3). Physical therapist management included examination, interventions, and evaluation within the scope of practice of a physical therapist that are typically provided by or under the direction and supervision of a physical therapist.[19]

Data Extraction

Characteristics of the clinical practice guidelines were summarized, including country of origin, organization, multidisciplinary team members, levels of evidence, grading system, and target audience. Data were also extracted on recommendations for examination, interventions, and evaluation applicable to physical therapist practice based on the American Physical Therapy Association's practice guidelines.[19] Examination was categorized as assessment processes performed prior to initial interventions. Interventions were categorized as exercise therapy (including functional training), patient education, manual therapy, patellar bracing, patellar taping, foot orthoses, electrotherapeutic modalities, and combined interventions. Evaluation was categorized as assessment processes to assess the effectiveness of physical therapy interventions.

Data Synthesis and Evaluation

Quality Assessment

The AGREE II instrument, a reliable and valid tool, was used to assess methodological quality of each clinical practice guideline.[20] The AGREE II tool consists of 23 items within 6 domains (scope and purpose; stakeholder involvement; rigor of development; clarity of presentation; applicability; editorial independence) and 2 items within an overall guideline assessment. For each clinical practice guideline, the 23 items within the 6 domains and 1 item from the overall guideline assessment ("rate the overall quality of this guideline") were scored independently by 4 authors using a 7-point scale (1-strongly disagree to 7 strongly agree). Domain scores were calculated by summing the individual item scores in a domain by the 4 appraisers and expressed as a percentage of the maximum score for each domain. Consistent with previous guideline reviews, domain scores more than 70% were considered high quality.[21,22] An overall quality score from the 1 overall guideline assessment item was calculated by summing the individual item scores from the 4 appraisers and expressed as a percentage of the maximum overall quality score. A meeting was held prior to scoring to discuss how to apply the appraisal criteria according to the AGREE II user's manual guidance.[12] To assess inter-rater agreement across the 4 appraisers of the AGREE II instrument, an intra-class correlation coefficient (ICC model 3,1) was calculated.

Clinical Applicability

Clinical applicability for physical therapist practice of each clinical practice guideline was measured using domain one from the AGREE-REX instrument.[13] Domain 1 (clinical applicability) consists of 3 items (evidence, applicability to target users, applicability to patients). Each item was scored independently by 4 authors using a 7-point scale (1, strongly disagree to 7, strongly agree) by assessing the recommendations for each guideline with an evaluation statement "suitability for use within physical therapist practice." This evaluation statement was selected to address the aim of this review. For each clinical practice guideline, an overall score for clinical applicability (domain 1) was calculated by summing the individual item scores by the 4 appraisers and expressed as a percentage of the maximum score. To assess inter-rater agreement across the 4 appraisers of domain 1 of the AGREE-REX instrument, an ICC model 3,1 was calculated.

Evaluation of Recommendations

An evaluation of recommendations included the convergence and divergence of recommendations across all the included clinical practice guidelines. This evaluation considered the quality of the guidelines based on AGREE II.

Results

The search strategy yielded 161 potential clinical practice guidelines. After title and abstract screening, 12 guidelines remained for full-text review. The most common reason for exclusion was not meeting the mandatory criteria to be included as clinical practice guideline (ie, systematic methods were not used to acquire evidence). One guideline was found via website searching and another via citation tracking of included guidelines using Google Scholar. Two guidelines were developed by an international consensus committee using similar methods,[23,24] with the 2018 guideline[24] an update of another guideline.[23] Therefore, these 2 guidelines were considered as 1 guideline resulting in 4 clinical practice guidelines for patellofemoral pain identified (Fig. 1). Table 2 reports the details and characteristics of included clinical practice guidelines.

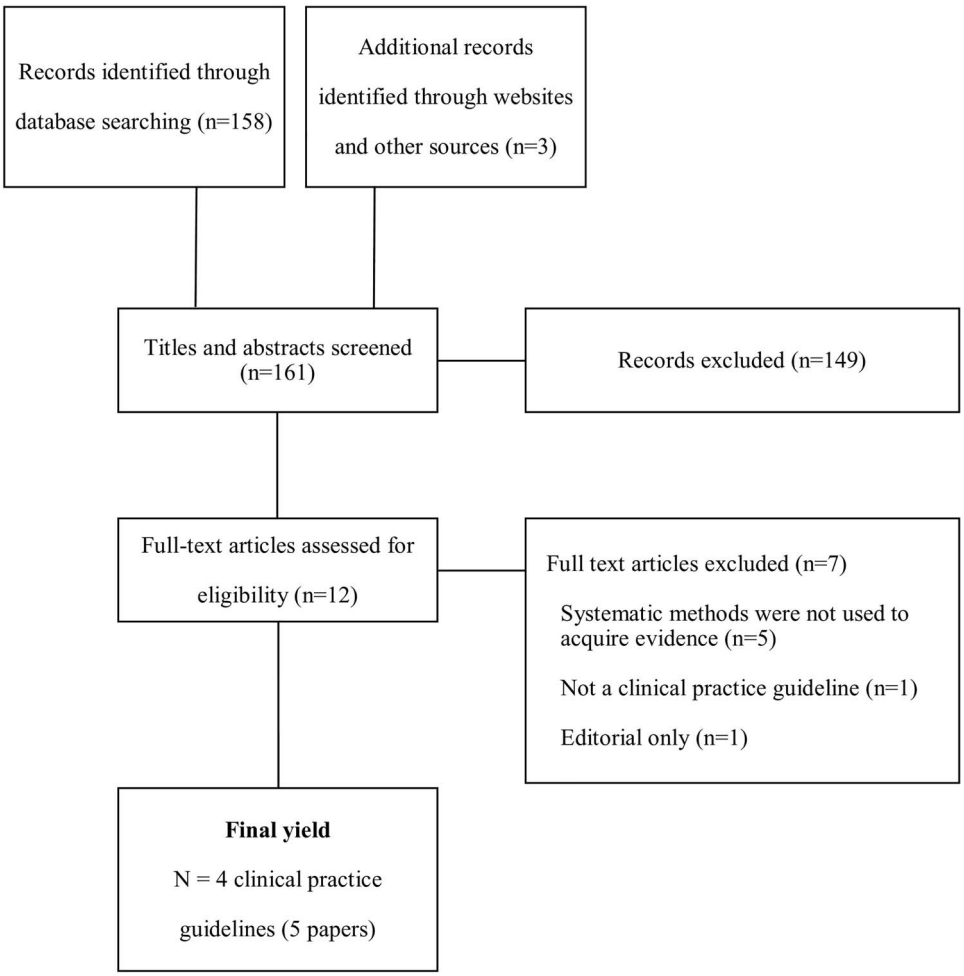

Figure 1. Yield of clinical practice guidelines.

Quality Assessment (AGREE II)

Results are reported in Table 3. One guideline[25] was rated as the highest quality based on the overall domain (92%), with very high-quality domain scores for 3 of the 6 domains, including stakeholder involvement (90%), rigor of development (92%), and clarity of presentation (97%). Across the 4 guidelines, the highest scoring quality domains included scope and purpose (ranging from 56% to 93%), rigor of development (ranging from 60% to 92%), and clarity of presentation (ranging from 78% to 97%). Across the 4 guidelines, the lowest scoring quality domain was applicability (ranging from 5% to 38%) with insufficient reporting of strategies to improve uptake of guideline recommendations. For editorial independence (ranging from 38% to 67%), 1 guideline[26] rated lowest quality with no disclosure of competing interests and management of conflicts in guidelines. For stakeholder involvement (ranging from 31% to 90%), 2 guidelines[15,24] mainly involved active researchers in the field of patellofemoral pain from a single discipline (eg, physical therapists) and did not include views and preferences of the people with patellofemoral pain. Two guidelines[25,26] rated highly in domain 2 because they involved multidisciplinary members. One guideline[26] did not include any active researchers as panel members in the field of patellofemoral pain, because the purpose of this guideline focused on the management of pediatric chronic pain. There was moderate inter-rater agreement between 4 raters of the AGREE II with an ICC (3,1) value of 0.58 (95% CI = 0.46–0.68).

Clinical Applicability (AGREE-REX)

One guideline[25] was rated as the most clinically applicable to inform physical therapist management based on the AGREE-REX tool's first domain (89%) with the largest scope of physical therapist interventions for patellofemoral pain, and the only guideline to include recommendations for examination and evaluation. Two guidelines[15,24] also rated highly in clinical applicability (78% and 72%, respectively), whereas 1 guideline[26] rated lower (42%). The key difference in clinical applicability was the scope of physical therapist–delivered interventions recommended for management of patellofemoral pain. One guideline[26] reported limited recommendations for the physical therapist management of patellofemoral pain with scope of the guideline focused on managing chronic adolescent pain conditions. There was moderate inter-rater agreement between 4 raters of the AGREE REX (domain 1) with an ICC (3,1) value of 0.52 (95% CI = 0.24–0.79).

Evaluation of the Recommendations

Recommendations for examination and evaluation are reported in Table 4. One guideline[25] included recommendations for examination processes to assist diagnosing

Table 2. Characteristics of Clinical Practice Guidelines[a]

Country, Reference	Organization	Multidisciplinary Team Developers	Levels of Evidence Adapted from CEBM	Grade System	Target Audience
Australia/UK Barton et al,[15] 2015	NA	5 Physical therapists	Level I: high-quality systematic review findings Level V: Expert opinion from 17 academic physical therapists or athletic trainers	No recorded grade system	Health professionals providing management of patellofemoral pain
Australia/UK Collins et al,[24] 2018; Crossley et al,[23] 2016	International Patellofemoral Research Retreat 5th (Gold Coast) and 4th (Manchester)	12 Physical therapists	Levels I, II: systematic review and randomized controlled trials. Level V: expert consensus opinion from 51 health professionals (with 41 active researchers in patellofemoral pain)	10-point scale, with 0–3 representing inappropriate, 4–6 uncertain, and 7–9 appropriate	Health professionals providing management of patellofemoral pain
UK Colvin et al,[26] 2018	Short Life Working Group for Pediatric Pain	13 Consultants, 3 allied health professionals, 1 pharmacist, 1 nurse, 2 research assistants, 3 project managers, 1 consumer, guideline reviewers, collaborators, and organizations part of development process	Levels I–V: (high-quality systematic reviews to expert opinion)	Scottish Intercollegiate Guidelines Network (SIGN) methodology	Health professionals involved in management of chronic pain in pediatrics
USA Willy et al,[25] 2019	The Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association	9 Physical therapists, guideline reviewers, organizations, panel of consumers and stakeholders part of development process	Levels I–V: (high-quality systematic reviews to expert opinion)	Grades A to F (eg, A = strong evidence, F = expert opinion)	Health professionals providing management of patellofemoral pain

[a]CEBM = Centre for Evidence Based Medicine, Oxford, UK.

Table 3. Trustworthiness of Clinical Practice Guidelines Using AGREE II[a]

Clinical Practice Guideline	Scope and Purpose	Stakeholder Involvement	Rigor and Development	Clarity of Presentation	Applicability	Editorial Independence	Overall Guideline Assessment
Barton et al,[15] 2015	68	31	60	82	14	65	58
Collins et al,[24] 2018	56	40	81	93	14	48	75
Colvin et al,[26] 2018	93	76	66	78	5	38	58
Willy et al,[25] 2019	60	90	92	97	38	67	92

[a]Percentage of maximum score for each domain, with higher percentages indicative of high quality. AGREE = Appraisal of Guidelines for Research and Evaluation.

patellofemoral pain based on signs, symptoms, activity limitations, and impairments, including a classification system to guide management. The same guideline included recommendations for evaluation of the effectiveness of interventions based on validated patient-reported outcome measures (PROMs) and clinical examination.

Recommendations for interventions are reported in Table 5. Recommendations converged across clinical practice guidelines regarding exercise therapy (recommended in 4 guidelines),[15,24–26] foot orthoses (recommended in 3 guidelines),[15,24,25] patellar taping (recommended in 3 guidelines),[15,24,25] acupuncture (recommended in 2 guidelines),[15,25] patient education (recommended in 2 guidelines),[15,25] combined interventions (recommended in 2 guidelines),[24,25] and electrotherapeutic modalities (not recommended in 2 guidelines,[24,25] with the exception of visual biofeedback that was recommended in 1 guideline).[15] Recommendations diverged for manual therapy and dry needling (eg, patellar manual therapy was recommended in 1 lower quality guideline in the presence of hypomobility of the patellar[15] and was not recommended in isolation in 2 higher-quality guidelines).[24,25] Recommendations also diverged for patellar bracing (recommended in 1 lower-quality guideline[15] and not recommended in 1 higher-quality guideline).[25]

Potential differences in the quality of the guidelines that may explain the divergent recommendations included: the

Table 4. Recommendations for Examination and Evaluation Applicable to Physical Therapist Management of Patellofemoral Pain

Clinical Practice Guideline	Examination	Evaluation
Barton et al,[15] 2015	X	X
Collins et al,[24] 2018	X	X
Colvin et al,[26] 2018	X	X
Willy et al,[25] 2019	Clinicians should use reproduction of retropatellar or peripatellar pain during squatting as diagnostic test. Clinicians should also use performance of functional activities that load PFJ in flexed position, such as stair climbing or descent, as diagnostic tests. Clinicians should make diagnosis of PFP using these 3 criteria: 1. Presence of retropatellar or peripatellar pain AND 2. Reproduction of retropatellar or peripatellar pain with squatting, stair climbing, prolonged sitting, or other functional activities loading PFJ in flexed position AND 3. Exclusion of all other conditions that may cause AKP, including tibiofemoral pathologies. Clinicians may use the patellar tilt test with presence of hypomobility to support diagnosis of PFP. Clinicians may assess body structure and function, including measures of patellar provocation, patellar mobility, foot position, hip and thigh muscle strength, and muscle length. Clinicians may use impairment/function-based PFP classification system to guide patient management according to predominant impairments in persons with PFP. Four subcategories proposed are: 1: overuse/overload without other impairment; 2: muscle performance deficits; 3: movement coordination deficits; 4: mobility impairments	Clinicians should use appropriate clinical tests that reproduce pain and assess lower-limb movement coordination, such as squatting, step-downs, and SLS. These tests can assess patient's baseline status relative to pain, function, and disability; global knee function; and changes in patient's status throughout course of treatment. Clinicians should use AKPS, KOOS-PF, or VAS for activity (EPQ) questionnaires to measure pain and function. Clinicians should use VAS for worst pain, VAS for usual pain, or NPRS to measure pain. Clinicians should use one of the translations and cross-cultural adaptations with demonstrated validity, reliability, and responsiveness to change for patients in different countries and for those requiring questionnaires in languages other than English.

[a]AKP = anterior knee pain; AKPS = Anterior Knee Pain Score; EPQ = Eng and Pierrynowski Questionnaire; KOOS-PF = Knee Osteoarthritis Outcome Score-Patellofemoral Subscale; NRPS = Numerical Pain Rating Scale; PFJ = patellofemoral joint; PFP = patellofemoral pain; SLS = single-leg squat; VAS = Visual Analog Scale; X = no recommendations reported.

date of the literature search, suggesting a greater body of literature and knowledge contributed to the development of the higher quality guidelines published more recently; the composition of the development group, with the lower-quality guideline[15] developed by a single discipline compared with the higher quality guidelines guidelines,[24,25] which included multiple disciplines and stakeholders; the body of literature included in the systematic development of the guideline recommendations, with the lower quality guideline[15] based on Level I evidence (systematic reviews) and level V evidence (expert opinion) compared with higher-quality guidelines, which also included Level II evidence[24]; or all levels of evidence.[25]

Discussion

To support the delivery of evidence-based, high-value physical therapist management of patellofemoral pain, 4 clinical practice guidelines for management of patellofemoral pain were evaluated. One guideline[25] rated very highly in 3 of the 6 domains using the AGREE II instrument and the highest of the 4 guidelines in 2 other domains. Also, this guideline included the most clinically applicable set of recommendations for examination, interventions, and evaluation for patellofemoral pain, making it appropriate to inform physical therapist practice. Guidelines were consistent with recommendations for exercise therapy, foot orthoses, patellar taping, patient education, and combined interventions and did not recommend the use of electrotherapeutic modalities. One guideline evaluated as higher quality[25] recommended examination and evaluation processes, including PROMs, and 2 guidelines evaluated as higher quality[24,25] did not recommend the use of manual therapy (in isolation), dry needling, and patellar bracing, which diverged from guidelines evaluated as lesser quality.[15]

Across all 4 clinical practice guidelines, exercise therapy (eg, combining knee and hip-targeted exercises) was recommended to be prescribed by physical therapists for treating patellofemoral pain due to proven effectiveness from a high-quality evidence base. Recommending exercise therapy is consistent with systematic reviews across broad areas of physical therapist practice,[27,28] including the management of patellofemoral pain,[29] and is also consistent with clinical practice guidelines across broad areas of musculoskeletal conditions, including low back pain[30] and osteoarthritis.[31] Other recommended treatments involving exercise that converged across the guidelines from this review included combined treatments of exercise therapy with short-term interventions (eg, patellar taping and prefabricated orthoses). These findings are significant for physical therapists who have a broad scope of practice to provide optimal management.

The quality of musculoskeletal care for common musculoskeletal conditions has been questioned with evidence of suboptimal implementation of recommended management, including overuse of ineffective interventions where evidence suggests little (or no) benefit for patients or is harmful.[32,33] One higher-quality guideline[25] recommended the use of validated PROMs as an important component of the physical therapist management of patellofemoral pain. This recommendation is consistent with physical therapy organizations and international initiatives recommending the collection of PROMs to evaluate the effectiveness of physical therapist management.[19,34] However, only 70% of physical therapists in primary care reported using PROMs in clinical practice,

Table 5. Recommendations for Interventions Applicable to Physical Therapist Management of Patellofemoral Pain[a]

Clinical Practice Guideline	Exercise Therapy, Including Functional Training	Patient Education	Manual Therapy (Includes Needling)	Patellar Bracing, Patellar Taping, and Foot Orthoses	Electrotherapeutic Modalities	Combined Interventions
Barton et al,[15] 2015	Incorporate quadriceps and gluteal strengthening. Target distal and core muscles where deficits exist. Consider stretching, particularly calf and hamstrings, based on assessment findings. Incorporate movement pattern retraining, particularly hip. Give preference to CKC exercises to replicate function. Consider OKC exercises in early stages of rehabilitation to target specific strength deficits and movements. Provide adequate supervision in early stages to ensure correct exercise techniques but progress to independence as soon as possible. When independent, limit number of exercises to 3 or 4 to aid compliance.	Ensure patient understands potential contributing factors to their condition and treatment options. Advise of appropriate activity modification. Manage patient's expectations regarding rehabilitation. Encourage and emphasize importance of participation in active rehabilitation.	For optimizing biomechanics, consider massage and acupuncture/dry needling to improve flexibility of tight muscle and fasciae structures, particularly laterally. For optimizing biomechanics, consider PFJ mobilization but only in presence of hypo-mobility. For optimizing biomechanics, consider mobilization of ankle and first ray in presence of sagittal plane joint restriction.	For pain reduction, provide PFJ braces where taping inappropriate (eg, skin irritation). Provide tailored patellar taping to reduce pain in immediate term. For pain reduction, consider foot orthoses. For optimizing biomechanics, consider foot orthoses based on assessment findings (ie, presence of excessive dynamic pronation).	Use biofeedback such as mirrors and videos to improve exercise quality	X
Collins et al,[24] 2018	Exercise therapy is recommended to reduce pain in short, medium, and long terms and improve function in medium and long terms. Combining hip and knee exercises recommended to reduce pain and improve function in short, medium, and long terms; this combination should be used in preference to knee exercises alone.	X	Patellofemoral, knee, and lumbar mobilizations are not recommended in isolation	Foot orthoses recommended to reduce pain in short term	Electrotherapeutic agents are not recommended	Combined interventions (exercise therapy as well as 1 of following: foot orthoses, patellar taping, or manual therapy) are recommended to reduce pain in adults with PFP in short and medium terms
Colvin et al,[26] 2018	Exercise therapy should be considered for children and young people with PFP to enhance long-term recovery and reduce pain	X	X	X	X	X

(*Continued*)

Table 5. Continued

Clinical Practice Guideline	Exercise Therapy, Including Functional Training	Patient Education	Manual Therapy (Includes Needling)	Patellar Bracing, Patellar Taping, and Foot Orthoses	Electrotherapeutic Modalities	Combined Interventions
Willy et al,[25] 2019	Clinicians should include exercise therapy with combined hip- and knee-targeted exercises to reduce pain and improve patient-reported outcomes and functional performance in short, medium, and long term (hip-targeted exercise therapy should target posterolateral hip musculature; knee-targeted exercise therapy includes either weight-bearing (resisted squats) or non–weight-bearing (resisted knee extension) exercise, as both exercise techniques target knee musculature; preference to hip-targeted exercise over knee-targeted exercise may be given in early stages of treatment of PFP; overall, combination of hip- and knee-targeted exercises preferred over solely knee-targeted exercises to optimize outcomes). Clinicians may use gait retraining consisting of multiple sessions of cuing to adopt forefoot-strike pattern (for rearfoot-strike runners), cuing to increase running cadence, or cuing to reduce peak hip adduction while running for runners.	Clinicians may include specific patient education on load management, body-weight management when appropriate, importance of adherence to active treatments like exercise therapy, biomechanics that may contribute to relative overload of PFJ, evidence for various treatment options, and kinesiophobia	Clinicians should not use manual therapy (in isolation), including lumbar, knee, or patellofemoral manipulation/-mobilization. Clinicians should not use dry needling. Clinicians may use acupuncture to reduce pain (however, caution should be exercised with this recommendation, as superiority of acupuncture over placebo or sham treatments is unknown).	Clinicians should not prescribe patellofemoral knee orthoses, including braces, sleeves, or straps. Clinicians may use tailored patellar taping in combination with exercise therapy to assist in immediate pain reduction and enhance outcomes of exercise therapy in short term (4 wk). Taping applied with aim of enhancing muscle function not recommended. Clinicians should prescribe prefabricated foot orthoses for patients with greater than normal pronation to reduce pain but only in short term (up to 6 wk). If prescribed, foot orthoses should be combined with exercise therapy program. Insufficient evidence to recommend custom foot orthoses over prefabricated foot orthoses.	Clinicians should not use EMG-based biofeedback on medial vastii activity to augment knee-targeted (quadriceps) exercise therapy. Clinicians should not use visual biofeedback on lower extremity alignment during hip- and knee-targeted exercises. Clinicians should not use ultrasound, cryotherapy, phonophoresis, iontophoresis, electrical stimulation, and therapeutic laser.	Clinicians may use blood flow restriction plus high-repetition knee exercise therapy while monitoring for adverse events for those with limiting painful resisted knee extension. Clinicians should combine physical therapist interventions (exercise, foot orthoses, taping, manual therapy), which results in superior outcomes compared with no treatment, flat shoe inserts, or foot orthoses alone in short and medium term. Exercise therapy critical component and should be focus in any combined intervention approach. Interventions to consider combining with exercise therapy include foot orthoses, patellar taping, patellar mobilizations, and lower-limb stretching.

[a]CKC = closed kinetic chain; EMG = electromyography; OKC = open kinetic chain; PFJ = patellofemoral joint; PFP = patellofemoral pain; X = no recommendations reported.

suggesting more strategies are needed to support physical therapists to adopt collection of PROMs in physical therapist practice.[35] For interventions, clinical practice guidelines recommending physical therapists not use treatments such as patellar bracing or electrotherapeutic modalities may also conflict with routine physical therapist practice. For example, a survey of 99 physical therapists showed 9% use patellar bracing and 5% use electrotherapeutic modalities for treating people with patellofemoral pain.[10] One could argue that use of patellofemoral bracing and electrotherapeutic modalities does not conflict with recommendations from 1 lower-quality clinical practice guideline from this review.[15] Therefore, not only is critical appraisal important for clinical practice guidelines but also to ensure physical therapists are aligned within health care systems to deliver high-value care by adopting recommendations from high-quality clinical practice guidelines into practice and ceasing use of interventions that are strongly advised against.[25]

An important issue relates to how best to support physical therapists in implementing the best available evidence into clinical practice. In a mixed methods study involving United Kingdom physical therapists, clinicians admitted their practice was mostly influenced by colleagues rather than being derived from good-quality evidence.[36] Several clinician-based barriers may contribute to the evidence-practice gap (eg, low awareness, skills, and motivation) by preventing clinicians from routinely applying guideline recommendations into musculoskeletal clinical practice.[37] Another potential barrier is the low scores in the quality assessment domain of applicability of all clinical guidelines evaluated in this review due to insufficient strategies to improve uptake of guideline recommendations. One approach that may close this evidence-practice gap and help physical therapists implement guideline-recommended care into clinical practice includes direct clinical supervision where physical therapists are directly observed in their management.[38] Clinical supervision is recommended for physical therapists to support their continued professional development and to ensure quality and safety of care is commonly practiced as reflective supervision.[39] The addition of direct clinical supervision models to provide guidance of clinical practice and feedback on compliance with clinical practice guideline recommendations may lead to improved quality of care via better guideline adherence and improved patient outcomes.[38] In the field of patellofemoral pain, alternative examples of educational knowledge translation strategies that may be effective for improving professional outcomes (eg, improved knowledge about guidelines) include research publications with practical tools to guide clinical practice[2] as well as online infographics and educational videos.[40]

Practice changes may be easier to address when examination, interventions, and evaluation are recommended (or not recommended) based on strong underlying evidence. However, uncertainty of recommendations commonly exists in clinical practice guidelines. For example, uncertainty may exist for interventions when the evidence base reflects limited efficacy, conflicting evidence, or unfavorable risk profiles or there is simply a lack of evidence from high-quality randomized controlled trials.[41] One example of an uncertain recommendation that *may* be used for treating patellofemoral pain was patient education.[42] Although patient education was an uncertain recommendation due to lack of evidence,[25] this is unlikely to have adverse effects. Patient education strategies may also be used as a tool to address psychological and social factors, such as misconceptions about exercise, pain, and potential harm common in people with patellofemoral pain.[43] Educational interventions that help address psychological and social impairments may help reduce the increased risk of persistent pain and poor outcomes for physical therapy treatment as has been shown in other common musculoskeletal conditions such as low back pain.[44] To aid clinical practice, use of validated outcome measures and monitoring of patient goals is recommended to inform clinicians as to whether to continue to offer and apply interventions with uncertain evidence base.[41] Also, patient-centered care encourages patient participation in decision making and communication with patients about their management options. Therefore, the challenge for physical therapists to apply evidence-based practice as identified in guidelines, in the context of their patients' clinical presentations, is to help people make the best decisions consistent with patient environmental and personal factors.

Limitations

This review was conducted by a team of clinical and academic physical therapists, and we did not include a multidisciplinary research team because the aim of this review was to inform physical therapist practice. Only English language clinical practice guidelines were included in this review, limiting the generalizability because other cultures with other languages might have different recommendations for management of patellofemoral pain. However, no potentially relevant guidelines were excluded based on this criterion. Although Willy et al[25] was rated as the highest quality of the 4 guidelines evaluated, 3 of the 6 domains were less than high quality (<70%). This suggests future work is needed on guideline development to improve guideline quality and successful implementation, for example, identifying and reporting on potential barriers (eg, low awareness, skills, and motivation) and facilitators (eg, direct clinical supervision) to implementing guideline recommendations.

This review supports the delivery of high-value physical therapist management of patellofemoral knee pain based on the best research evidence. Of the 4 clinical practice guidelines included, 1 guideline evaluated as higher quality provided the most clinically applicable set of recommendations for examination, interventions, and evaluation processes, including PROMs, to assess the effectiveness of interventions. Guideline-recommended interventions were consistent for exercise therapy, foot orthoses, patellar taping, patient education, and combined interventions and did not recommend the use of electrotherapeutic modalities. Two guidelines evaluated as higher quality did not recommend the use of manual therapy (in isolation), dry needling, and patellar bracing. Recommendations from higher-quality guidelines may conflict with routine physical therapist management of patellofemoral pain.

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Clinical Trial/Systematic Review Registration

This review was not registered in PROSPERO.

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