

Systematic review

# Best tests/clinical findings for screening and diagnosis of patellofemoral pain syndrome: a systematic review

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## Abstract

**Background** Diagnosis of patellofemoral pain syndrome (PFPS) is commonly performed using a myriad of clinical and imaging-based criteria.

**Objectives** The objective of this systematic literature review was to summarize the research on accuracy of individual clinical tests/findings for PFPS.

**Data sources** MEDLINE, ProQuest Nursing and Allied Health, Cochrane Trials, PEDro, and CINAHL.

**Study selection or eligibility criteria** PRISMA guidelines were followed for this review. To be considered for review, the study required: (1) a description of a clinical test or tests used for diagnosing PFPS (including a test that was combined with another finding such as patient history), (2) a report of the diagnostic accuracy of the measures (e.g., sensitivity and specificity), and (3) an acceptable reference standard for comparison.

**Study appraisal or synthesis methods** *Quality Assessment of Studies of Diagnostic Accuracy* (QUADAS) scores were completed on each selected article. Sensitivity, specificity, and negative and positive likelihood ratios (LR<sup>-</sup>/LR<sup>+</sup>) were calculated for each diagnostic test described.

**Results** The systematic search strategy and hand search revealed 704 potential articles, 9 of which met the criteria for this review; analysing a total of 22 PFPS clinical tests. After assessment using the QUADAS score, 1 of the 9 articles was of high quality. The tests with the highest reported diagnostic value were also associated with studies that had the lowest QUADAS values.

**Conclusion** A majority of the studies that have investigated diagnostic accuracy of clinical tests for PFPS demonstrate notable design or reporting biases, and at this stage, determining the best tests for diagnosis of PFPS is still difficult.

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**Keywords:** Diagnosis, differential; Patellofemoral pain syndrome; Review, systematic; Sensitivity and specificity

## Introduction

Patellofemoral pain syndrome (PFPS), also historically described as chondromalacia of the patella, is a common knee problem that is more prevalent in active females [1–3] and youths who participate in sports [4]. The syndrome is associated with pain in the anterior aspect of the knee, including the patella and the surrounding retinaculum, but depending on the reference sources, does not typically involve tibial–femoral or peripatellar structures [5]. Patients with PFPS have both

intrinsic anatomic findings and extrinsic external factors that may contribute to the pathophysiology [6].

Although a number of proposed features have been suggested as a cause of PFPS, there remains no consensus on the aetiology of the disorder [2]. Suggested causes have included malalignment of the lower extremity [7], muscular imbalance [7], lateral retinaculum tightness [8], cartilage disruption [7], increased Q angle [8], dynamic alignment disorders [2], overuse [8], and abnormal hip mechanics [9]. The diagnosis of PFPS has been as elusive as the aetiology [6]. At present, there is no consensus on the reference standard for diagnosis of PFPS, nor is there a consistent use of clinical or functional tests to diagnose the condition [3,6,10].

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Therefore, PFPS is considered a multifactorial clinical diagnosis and is often made after careful evaluation of complaints of pain, identification of origin of symptoms, assessment of performance deficits, and investigation of appropriate imaging [3,6,8,11,12].

The physical assessment of PFPS often involves patellar mobility examination, assessment of selected activities such as squatting, jumping, step-down activities, special tests, and static assessment elements such as Q-angle measurement, hip positioning, and foot biomechanics during gait [13]. To date, there has been no summary document that has explored the validity of clinical tools that reflect these assessment areas. Consequently, the purpose of this study was to investigate the diagnostic accuracy of selected clinical tests/clinical findings for PFPS and investigate the quality of the studies that have investigated these values. Summary findings will be useful for clinicians since diagnosis typically originates in clinical practice environments.

## Methods

### Study design

This systematic review used the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines during the search and reporting phase of the research process. The PRISMA statement includes a 27-item checklist designed to improve reporting of systematic reviews and meta-analyses [14]. The PRISMA guidelines were designed for use in summarizing randomized controlled trials but can be used for multiple forms of research methodologies [15].

### Search strategy

A computer based search strategy was conducted using MEDLINE (MESH terms) and CINAHL, ProQuest Nursing and Allied Health, PEDro, and Cochrane Trials databases (keywords) to locate research conducted on diagnostic accuracy of physical examination tests for PFPS. The MESH search terms for MEDLINE included: (*sensitiv\*[Title/Abstract] OR sensitivity and specificity[MeSH Terms] OR diagnos\*[Title/Abstract] OR diagnosis[MeSH:noexp] OR diagnostic\*[MeSH:noexp] OR diagnosis, differential[MeSH:noexp] OR diagnosis[Subheading:noexp]*) AND (*Patellofemoral Pain Syndrome OR Chondromalacia Patella OR Patellofemoral Syndrome OR Retropatellar Pain Syndrome OR Patellofemoral Arthralgia OR Extensor Mechanism Disorders OR Lateral Patellar Compression Syndrome OR Patellofemoral Dysfunction*). The keyword search for CINAHL, ProQuest Nursing and Allied Health, PEDro, and Cochrane Trials databases included *patellofemoral pain syndrome* and *diagnostic accuracy*. Google Scholar was also examined for any grey literature that was not represented within the database. Because computerized search results

for sensitivity and specificity frequently omit many relevant articles [16], a detailed hand search of the references from a textbook [17] and thorough review of all accepted papers were also performed. The search was limited to humans and English language. The terminal date of electronic and hand articles searches was September 1, 2011.

### Study selection

Each abstract and subsequent full text article selected was initially reviewed by two authors (CC and EJH) and further independently reviewed by two more (CC and MR). Consensus was used in situations where indecision to include an article occurred. After obtaining the full text articles, the two reviewers independently reviewed each paper for inclusion to the study.

### Inclusion/exclusion criteria

For inclusion to the review, the study required: 1) a description of a clinical test or tests used for diagnosing PFPS (including a test that was combined with another finding such as patient history), 2) a report of the diagnostic accuracy of the measures (e.g., sensitivity and specificity), and 3) an acceptable reference standard for comparison. The clinical diagnosis of PFPS is often made using functional tests [8] and by exploring causative situational and performance factors [11]. Because PFPS is considered a clinical diagnosis that involves multiple findings and multifactorial considerations that lack consensus definition within the literature [6,9,12], and because the clinical findings often do not always strongly correlate with imaging findings [8], we independently reviewed each study's reference standard to assure the standard involved an acceptable clinical, surgical, and/or imaging assessment. We accepted any diagnosis confirmed by arthroscopic surgery. If otherwise, we defined 'acceptable' if the clinical and or imaging assessments were associated with functional losses, pain identified near the anterior aspect of the knee that was reproducible during defined mechanical activities (such as long term sitting, stair climbing, etc.) or if imaging demonstrated retropatellar changes associated with overuse.

If a paper failed to provide any of the three measures (1) clinical measure, 2) report of diagnostic accuracy, and 3) appropriate reference standard) that paper was not included in this review. We further excluded any studies that involved imaging alone without clinical examination tests, reports of the value of a non-specific clinical examination, and those studies that used instrumentation not readily available to all clinicians.

### Quality assessment

Once all full text inclusion articles were acquired, each was assessed independently by two authors (EJH and CC) for quality using the *Quality Assessment of Diagnostic Accuracy*

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