



Standard of Care: Patellofemoral Pain Syndrome (PFPS)

ICD 9 Codes: 719.46, 717.7

Case Type / Diagnosis:

Patellofemoral Pain Syndrome – A general category of anterior knee pain that develops as a result of patella malalignment and/or altered Patellofemoral (PF) joint forces. PFPS may also be termed anterior knee pain, patellar malalignment, and PF antrhalgia. Patellofemoral syndrome is a collection of signs and symptoms which may encompass body regions ranging from the lumbar spine to the toes.

Chondromalacia – Softening and fissuring of the underside of the patella.¹ Chondral lesions themselves are asymptomatic unless worn down to subchondral bone.¹ Chondromalacia can only be diagnosed by way of imaging or surgery.

Indications for Treatment:

Knee pain believed to be musculoskeletal in origin, primarily from muscle imbalances and/or poor biomechanics which abnormally load the PF joint or structures around the joint. Patients report symptoms as general knee pain or ache surrounding the patella. Physical therapy for PF pain has been shown to be significantly better than operative treatment.^{2, 3}

Contraindications / Precautions for Treatment:

Treatment involves reducing activities that cause excessive PF joint reaction forces. Below are exercise considerations for patients performing lower extremity exercises.

- Lateral patellar displacement is more pronounced during non-weight bearing knee extension exercise, compared to weight bearing in patients with lateral patella subluxation.⁴ Both weight-bearing and non-weight bearing quadriceps strengthening exercises demonstrated increased muscle strength, decreased pain, and increased function on the Kujala scale.⁵
- Internal femoral rotation was greater during weight bearing knee extension than non-weight bearing extension from 18 to 0 degrees in patients with lateral patella subluxation.⁴
- From 30 to 12 degrees of knee extension, lateral patellar displacement is more pronounced in non-weight bearing as opposed to weight bearing in patients with a history of lateral patellar subluxation.⁶

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Evaluation:

Medical History: Review patient's medical history questionnaire and medical history reported in the electronic Longitudinal Medical Record (LMR). Review any diagnostic imaging, tests, or work up listed under LMR and Centricity. Ask about possible lower extremity trauma, injury, or history of fractures or falls.

History of Present Illness: PF pain is often insidious in onset. Symptoms are commonly worse with prolonged sitting, squatting, and descending stairs.^{1,2} Review footwear history and training schedule. Patients may have a subjective report of anterior knee pain with running, negotiating stairs, jumping, or prolonged sitting. For accurate assessment, activities that provoke or alleviate the patients' symptoms need to be identified and documented.

Social History: Denote participation in sports or athletic activities in the past or current.

Medications: NSAIDS, Acetaminophen. Patients may be prescribed either.

Examination:

This section is intended to capture the most commonly used assessment tools for this case type/diagnosis. It is not intended to be either inclusive or exclusive of assessment tools.

Pain: The patient may report symptoms felt anywhere circumferential to the anterior knee or retropatellar region. The Verbal Analog Scale (VAS) should be used to describe pain felt at rest and with selected provocative activities such as sitting to standing, step-downs, and stair negotiation.

Palpation: Palpate for medial or lateral patella border pain. Patients may have thickening of retinacular tissues, tenderness at the medial patella ligament, and tenderness at either the superior or inferior poles

Lumbar and Lower Quarter Screen.

ROM & Muscle length: Assess for shortening of:

- Gluteus Maximus
- Tensor Facia Latae (Thomas test)
- Iliotibial Band length (Ober's test)
- Hamstrings/(90/90 test)
- Rectus Femoris/Iliopsoas(Thomas test)
- hip, knee, ankle, and foot flexibility

Strength: Assess for trunk and/or lower extremity weakness via manual muscle testing or use of a dynamometer. Assess for:

- Muscle imbalance between hip internal rotators and external rotators.
- VMO atrophy or weak quadriceps.
- Weak, hamstrings, and
- Weak hip extensors and
- Weak abductors.

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- Any lower extremity muscular weakness

Sensation: via lower quarter screen

Posture/alignment: Document increased tibiofemoral varum/valgum or tibial varum. It has been shown that normal subjects with hypermobility exhibit larger Q angles than normal subjects with normal mobility.⁷ It has also been shown that patients with greater amounts of medial rotation of the femur with respect to the tibia, produce larger amounts of contact area at the patellofemoral joint.^{8,9} Take notice of the patients foot position and footwear. Excessive or late pronation during gait can increase tibial internal rotation, thus altering patellofemoral forces. Measurement differences in leg length inequality should be documented as this can lead to increased or asymmetrical loading of one leg.

Functional Mobility: The patients functional mobility needs to be assessed. Patient strategies for performing transfers and negotiating stairs should be observed and documented. Note any gait deviations, use of an assistive device. Patient self reported tolerance to pain or fatigue should be documented with a quantifiable measure such as distance walked or duration of time before onset of symptoms.

Tests and Measures:

Clinical Special Tests for PFPS that have demonstrated good diagnostic value.

Vastus Medialis Coordination Test¹⁰

With the patient supine, the clinician places their fist under the distal femur so that the knee is slightly flexed. The patient slowly actively extends their knee. Full extension and coordinated movement are observed. A positive test is recorded if the knee does not achieve full extension, or if knee control was not apparent.

Sensitivity: 16.1% and Specificity: 92.9%.

Patellar Apprehension Test¹⁰

With the patient in supine and the knee flexed to 30 degrees, the examiner places a lateral glide on the patella. At that range and during concurrent lateral patellar glides, the knee and hip are simultaneously flexed. A positive test is recorded if the knee is not fully extended due to fear or if control of the knee was not apparent during the movement.

Sensitivity: between 32.3-39% and Specificity: 85.7%.

Clarke's Test¹⁰

With the patient is supine and the affected knee is slightly flexed, the clinician provides an inferior force to the patella with slight compression. The patient then contracts their quadriceps. A positive test is pain elicited during the

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quadriceps contraction concurrently during the inferior glide and compression of the patella.

Sensitivity: 48.4 and Specificity: 75%

Eccentric Step Test¹⁰

The patient stands with the affected leg up on a 15cm step. The patient keeps hands on hips, and is instructed to slowly lower the foot of the unaffected leg to the floor. The affected leg eccentrically controls the lowering. A positive test is concordant reproduction of symptoms. If the patient is unable to be tolerated the Eccentric Step Test, the height may be modified.

Sensitivity: 41.9% and Specificity: 82.1%

Functional Measures:

- Sitting tolerance – note time.
- Stair negotiation without pain – observe and note.
- Kneeling without pain – able to or not.
- Sports participation – identify recreation and time spent.
- Performing regular exercise/fitness activity
- Lower Extremity Functional Scale(LEFS) - document

Differential Diagnosis:¹¹

- Referred pain from the low back or hip
- Articular cartilage injury
- Hoffa's Disease
- Neuromas
- Iliotibial Band Syndrome
- Patellar Stress Fracture
- Prepatellar Bursitis
- Symptomatic Bipartite Patella
- Loose Bodies
- Pes Anserine Bursitis
- Saphenous Neuritis
- Quadriceps or Patellar tendinopathy
- Sinding-Larsen-Johansson Syndrome
- Osteochondritis dessicans
- Osgood-Schlatter disease
- Bone tumor
- Patellofemoral arthritis
- Inflammatory joint disease
- Meniscal pathology
- Synovial plica

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Assessment:

Problem List:

Currently there is no reliable method for objectively assessing patellofemoral biomechanics.¹² The primary patient focused short term goals are to reduce pain and to improve function.

- Pain: The goal is to increase joint protection and self-management of symptoms.
- Loss of function: Intolerance to performing a specific activity limited by pain.
- Impaired joint mobility: Lateral tracking of the patella, or impaired joint mobility of the tibio-femoral and/or proximal tibio-fibula joints.

- Impaired muscle length: Lower extremity muscle shortening particularly of the lateral structures such as the hamstrings, Iliotibial band, lateral retinaculum, and/or quadriceps.
- Impaired posture: Poor foot/knee/ hip posture during gait/functional activities.
- Impaired muscle performance:
 - Muscle imbalance between hip internal rotators and external rotators.
 - VMO atrophy or weak quadriceps.
 - Weak, hamstrings, and
 - Weak hip extensors and
 - Weak abductors.
 - Any lower extremity muscular weakness.

Prognosis: The patient's prognosis is dependent upon a completed history and examination to determine predisposing biomechanical faults contributing to the PFPS. Approximately 70% of patellofemoral disorders improve with conservative treatment and time.¹¹

Goals:

In 0-6 weeks:

- Initial self symptom management and joint protection
- Normal glide of the patella
- Independent with initial home exercise program
- Determine need for orthotics or proper shoe wear
- Independent with progressed home exercise program

In 6-12 weeks:

- Normalize muscle length or achieve muscle length goals
- Independent self-management of symptoms
- Achieve all muscle strength goals
- Negotiating stairs unlimited
- Return to sports or previous activity
- Achieve functional goals (LEFS improvement)

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Treatment Planning / Interventions

Established Pathway Yes, see attached. No
Established Protocol Yes, see attached. No

Interventions most commonly used for this case type/diagnosis.

Treatment interventions typically target altered patellofemoral biomechanics. There is a need to control tibiofemoral rotation and increase patellofemoral contact area to reduce pain.⁹ Successful treatment has involved stretching, strengthening, tibiofemoral and patellofemoral joint mobilization, lumbopelvic mobilization, biofeedback, and patella taping, patient education in joint protection, posture, use of ice or moist heat.

Taping: has been shown to reduce pain and improve function in patients with patellofemoral symptoms, however, the rationale for why this works has not been confirmed.¹³ PF taping every day for 4 weeks has been shown to improve outcomes when coupled with exercise involving strengthening and stretching. The goal of the McConnell taping approach is to correct abnormal tilt, glide, or rotation to improve quadriceps activation.¹⁴ A preliminary clinical prediction rule for taping may be helpful in deciding who will best benefit from taping. If the patient has a positive patellar tilt test and/or tibial varum greater than 5° then there is an 83% chance they will reduce their knee pain with taping by 50%.¹⁵

- **Patellar tilt test:** Patient is supine. With the subject relaxed, the examiner glides the patella laterally and attempts to lift the lateral border of the patella anteriorly.¹⁵
 - The measurement is documented as:
 - no lift (-)
 - lift to neutral (level with a horizontal plane)
 - lift above the horizontal plane (+).
- **Tibial angulation(varus or valgus):** Measured with the patient standing on a 20-cm step. The measurement is taken using a goniometer as the angle formed by the horizontal surface of the step and the line that bisects the Achilles tendon. Tibial varum is defined as the distal end of the tibia being more medial than the proximal end.¹⁵

Strengthening: of the gluteus maximus and gluteus medius, quadriceps, and hamstrings are essential for long term successful self management of PFPS.¹⁶

It has been shown that patients who exhibit PF pain and symptoms are more likely to have weakness in their hip abductors and external rotators. Patients with PFPS may exhibit an inability to resist knee valgus and femoral internal rotation when decelerating or descending steps. Specifically strengthening hip external rotators eccentrically will help with gait and stability.¹⁷

Strengthening of the quadriceps has been shown to correlate with long term beneficial outcomes.¹⁸ Strengthening can be performed in both an open chain and a

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closed chain position, however, no significant difference has been found with quadriceps strengthening performed open chain, closed chain, isometrically or eccentrically.¹⁶ It is important to work within a pain free ROM or the vastus medialis oblique will be inhibited. This can be done with limited ROM squats and graduated step-ups/downs.

Stretching: Tight structures such as the iliotibial band and lateral retinaculum or shortened muscles such as the hamstrings, quadriceps, hip flexors, and gastrocnemius/soleus complex should be stretched.

Stabilization: Stabilization/balance/proprioceptive exercises for the lower extremity.

Foot Orthotics - Shown to significantly decrease PF related pain. If foot orthotics reduce the PFP symptoms, other PT treatment may not yield a better outcome.¹⁹ It has been proposed that foot orthotics reduce pain by reducing:²⁰

- Lower extremity internal rotation
- Q-angle
- PF contact pressures
- Laterally-directed soft tissue forces from the patellar tendon, quadriceps tendon, and iliotibial band

Lumbopelvic manipulation: Has been shown in some cases to facilitate kinetic chain realignment which may reduce PF joint reaction forces via the theory of regional interdependence. There may be a biomechanical link to alterations in joint mobility of the lumbar spine, sacroiliac joint, or hip joint from the knee. If lumbopelvic misalignment is found during the screen, and sacroiliac special tests confirm dysfunction, then addressing the dysfunction with lumbopelvic manipulation may improve the outcome. A Preliminary Clinical Prediction Rule for patients who will benefit from lumbopelvic manipulation to improve PF symptoms...

- Side to side difference in hip internal rotation > 14 degrees
- Ankle dorsiflexion (knee flexed) >16 degrees
- Navicular drop > 3mm
- No self-reported stiffness with sitting > 20 minutes
- Squatting reported as most painful activity

Patient that met these criteria may benefit from a lumbopelvic manipulation to the affected side.^{21, 22}

Frequency & Duration: 2-3x/wk for 8-12 wks

Patient / family education:

- Home exercise program
- Flexibility training
- Strength training
- Footwear modification
- Joint protection
- Patella taping

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Recommendations and referrals to other providers.

- **Acupuncture** has been show to significantly reduce pain and increase function in patients with PFPS.²³
- Orthosis
- Orthopedics
- Protonics knee brace²⁴

Re-evaluation

Standard Time Frame- 28 days

Other Possible Triggers- A significant change in signs and symptoms, identify appropriate possibilities that happen in the case type

Discharge Planning

Commonly expected outcomes at discharge:

- Improved or normalized muscle length
- Normal joint mobility
- Normal muscle strength
- Normalized muscle imbalances at the spine, hip, knee, and foot
- Correct shoe wear
- Achievement of the patient goals
- Improved functional score on the Lower Extremity Functional Score

Transfer of Care

D/C to independence with a home exercise program.

Patient's discharge instructions

Continue with stretching, strengthening, patella mobilizations, and patella taping if needed.

Original Author:

Edward Boudreau, PT 5/2004

Revised Author:

Kenneth J. Shannon, PT 8/2009

Reviewed by:

Sharon Alzner, PT
Michael Cowell, PT

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