Rehabilitation Protocol for Patellofemoral Pain Syndrome

This guideline is intended to provide the clinician with a guideline of the non-operative course of care for Patellofemoral Pain Syndrome. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary. If a clinician requires assistance in the progression of a patient, they should consult with the referring provider.

The interventions included within this protocol are not intended to be an inclusive list. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

Patellofemoral Pain Syndrome (PFPS) is a general category of anterior knee pain that is characterized as pain behind or around the patella, as a result of patella malalignment, altered patellofemoral (PF) joint forces and/or repetitive stress to the area. Also known as Runner's Knee, chondromalacia patella, retropatellar pain syndrome, anterior knee pain syndrome, patellar malalignment, and patellofemoral arthralgia. Patellofemoral syndrome can have a collection of signs and symptoms which may encompass body regions throughout the kinetic chain, from the lumbar spine to the feet.

Diagnosis Considerations	• Pain: typically reported anywhere circumferential to the anterior knee or retropatellar region. • Common Aggravating Factors: prolonged sitting, squatting, climbing/descending stairs, running, and jumping. • Increased tibiofemoral varum/valgum or tibial varum: normal subjects with hypermobility exhibit larger Q angles than normal subjects with normal mobility. Patients with greater amounts of medial rotation of the femur with respect to the tibia, typically produce larger amounts of contact area at the patellofemoral joint. • Foot position/footwear. Excessive or late pronation during gait can increase tibial internal rotation, thus altering patellofemoral forces. • Higher-level activities which include landing with excessive hip internal rotation and/or knee valgus may contribute to abnormal PF joint loading. • Strength deficits (including balance and eccentric control) may be noticeable throughout the lower extremity and lumbopelvic region. • Special tests: Vastus Medialis Coordination Test, Patellar Apprehension Test, Clarke's Test, Eccentric Step Test, McConnell's Test, Patellar Tilt Test, Tibial Angulation Test	
Differential Diagnosis	• Articular cartilage injury • Bone tumor • Chondromalacia patella • Referred pain from low back or hip • Hoffa's Disease • Iliotibial Band Friction Syndrome • Inflammatory joint disease • Loose Bodies • Meniscal pathology • Neuromas	• Osgood-Schlatter disease • Osteochondritis dessicans • Patellar stress fracture • Patellofemoral arthritis • Pes Anserine Bursitis • Prepatellar Bursitis • Quadriceps/Patellar tendinopathy • Sinding-Larsen-Johansson Syndrome • Symptomatic Bipartite Patella • Synovial plica

PHASE I: IMMEDIATE/ACUTE (0-2 WEEKS)

Rehabilitation Goals	• Reduce any swelling, minimize pain • Restore patellar, lower extremity mobility (including hip and ankle) • Restore tolerance to full motion • Minimize arthrogenic muscle inhibition and re-establish quadriceps, hip control • Patient education

	○ Minimize aggravating factors as much as possible, such as descending stairs, prolonged sitting, running, jumping ○ Initial self-symptom management and joint protection ○ Independent with initial home exercise program
Interventions	During this early phase, numerous manual interventions may be utilized to reduce the patient's pain, restriction to movement, and joint loading: • Soft Tissue Mobilization/Instrument-Assisted Soft Tissue Mobilization • Patellar Taping (McConnell, Kinesiotaping) • Ischemic compression/Bloodflow Restrictive Training • Dry Needling • Nerve mobilization • Joint mobilization/manipulation • Strengthening • Stretching *Mobility* • Stationary biking for tolerable mobility (minimal resistance) • *Stretching/Foam rolling* ○ Hip flexors ○ Hamstrings ○ Quadriceps ○ Iliotibial band ○ Adductors ○ Hip extensors/rotators ○ Gastroc-soleus complex *Strengthening* • Quadriceps isometrics at 0, 45, 90 degrees of flexion • Straight leg raise • Bridge/unilateral bridging • Sidelying clamshells • Sidelying hip abduction • Core/lumbopelvic stabilization (transverse abdominus, multifidus lifts, front/side planks)
Criteria to Progress	• Full knee motion, compared to uninvolved side • Appropriate quad contraction with superior patella glide and full active extension • Able to perform straight leg raise without lag or pain • Full tolerance to weightbearing with relative knee extension

PHASE II: INTERMEDIATE/SUB-ACUTE (2-4 WEEKS)

Rehabilitation Goals	• Progress to closed-chain/weightbearing activities without loading of knee flexion • Maintain full ROM • Tolerance to closed chain strengthening without loading of knee joint in flexion • Independent with progressed home exercise program, all daily activities
Additional Interventions **Continue with Phase I interventions as indicated*	*Strengthening* • Sumo walks • Monster walks • 4-way hip drills *Balance/proprioception* • Single-leg stance • Clock taps • Ball toss *Correction of movement abnormalities with functional tasks*

Criteria to Progress	• Tolerance to weightbearing activities • Maintenance of full ROM • Normalize muscle length or achieve muscle length goals

PHASE III: LATE/CHRONIC (4-6 WEEKS)

Rehabilitation Goals	• Maintain full ROM • Promote proper movement patterns • Avoid post exercise pain/swelling • Achieve all muscle strength goals • Negotiating stairs unlimited • Full tolerance to closed chain knee joint loading with flexion, with appropriate eccentric control • Achieve all muscle strength goals • Achieve daily/functional goals
Additional Interventions **Continue with Phase I-II Interventions as indicated*	*Strengthening* • Partial squat, squat to chair, wall slide, progressing to functional squat pattern • Lunge/reverse lunge • Step ups • Step downs, eccentric loading *Correction of movement abnormalities with sport-related tasks* *Return to Running Program*
Criteria for Discharge	• Independent self-management of symptoms • Demonstrate appropriate understanding of condition and maintenance to prevent risk of recurrence

Revised 6/2021

Contact	Please email MGHSportsPhysicalTherapy@partners.org with questions specific to this protocol

References:

Chang WD, Chen FC, Lee CL, Lin HY, Lai PT. Effects of Kinesio Taping versus McConnell Taping for Patellofemoral Pain Syndrome: A Systematic Review and Meta-Analysis. Evidence-Based Complementary and Alternative Medicine. 2015; 1-11.

Sueki D, Brechter J. Orthopedic Rehabilitation Clinical Advisor. 1st ed. Maryland Heights, Missouri: Mosby; 2009. 598-599.

Arazpour M, Bahramian F, Abutorabi A, Nourbakhsh ST, Alidousti A, Hamidreza Aslani. The Effect of Patellofemoral Pain Syndrome on Gait Parameters: A Literature Review. The Archives of Bone and Joint Surgery. October 2016; 4(4): 298-306.

Espí-López GV, Arnal-Gómez A, Balasch-Bernat M, Inglés M. Effectiveness of Manual Therapy Combined with Physical Therapy in Treatment of Patellofemoral Pain Syndrome: Systematic Review. Journal of Chiropractic Medicine. June 2018; 139-146.

Boling MC, Padua DA, Marshall SW, Guskiewicz K, Pyne S, Beutler A. A prospective investigation of biomechanical risk factors for patellofemoral pain syndrome: the Joint Undertaking to Monitor and Prevent ACL Injury (JUMP-ACL) cohort. American Journal of Sports Medicine. 2009; 37 (11): 2108-2116.

Crossley K, Bennell K, Green S, Cowan S, McConnell J. Physical therapy for patellofemoral pain: A randomized, double-blinded, placebo-controlled trial. The American Journal of Sports Medicine. 2002; 30(6): 857-865.

Kettunen JA, Harilainen A, Sandelin J, et al. Knee arthroscopy and exercise versus exercise only for chronic patellofemoral pain syndrome: A randomized controlled trial. BMC Medicine. 2007; 5 (1): 38.

Ferber R, Bolgla L, Earl-Boehm JE, Emery C, Hamstra-Wright K. Strengthening of the Hip and Core Versus Knee Muscles for the Treatment of Patellofemoral Pain: A Multicenter Randomized Controlled Trial. Journal of Athletic Training. 2015; 50 (4): 366-377.

Dolak KL, Silkman C, McKeon JM, Hosey RG, Lattermann C, Uhl TL. Hip Strengthening Prior to Functional Exercises Reduces Pain Sooner Than Quadriceps Strengthening in Females With Patellofemoral Pain Syndrome: A Randomized Clinical Trial. Journal of Orthopaedic & Sports Physical Therapy. August 2011; 41 (8): 560-570.

Herrington L, Al-Sherhi A. A controlled trial of weight-bearing versus non-weight-bearing exercises for patellofemoral pain. Journal of Orthopaedic & Sports Physical Therapy. 2007; 37 (4): 155-160.

Powers CM, Ward SR, Fredericson M, Guillet M, Shellock FG. Patellofemoral kinematics during weight-bearing and non-weight-bearing knee extension in persons with lateral subluxation of the patella: A preliminary study. Journal of Orthopaedic & Sports Physical Therapy. 2003; 33 (11): 677-685.

Flynn TW, Soutas-Little RW. Patellofemoral joint compressive forces in forward and backward running. Journal of Orthopaedic & Sports Physical Therapy. 1995; 21 (5): 277-282.

Huang BY, Shih YF, Chen WY, Ma HL. Predictors for Identifying With Patellofemoral Pain Syndrome Responding to Femoral Nerve Mobilization. Archives of Physical Medicine and Rehabilitation. 2015; 96: 920-97.

Liao TC, Yang N, Ho KY, Farrokhi S, Powers CM. Femur Rotation Increases Patella Cartilage Stress in Females with Patellofemoral Pain. Official Journal of the American College of Sports Medicine. 2015; 1775-1780.

Ramskov D, Barton C, Nielsen RO, Rasmussen S. High Eccentric Hip Abduction Strength Reduces the Risk of Developing Patellofemoral Pain Among Novice Runners Initiating a Self-Structured Running Program: A 1-Year Observational Study. Journal of Orthopaedic & Sports Physical Therapy. March 2015; 45 (3): 153-161.

Yilmaz Yelvar GD, Baltaci G, Bayrakci Tunay V, Atay AO. The effect of postural stabilization exercises on pain and function in females with patellofemoral pain syndrome. Acta Orthrop traumatol Turc. 2015; 49 (2): 166-174.

Glaviano NR, Saliba S. Impairment based rehabilitation for patellofemoral pain patients. The Physician and Sportsmedicine. 2016; 44 (3): 311-323.

Miao P, Xu Y, Pan C, Liu H, Wang C. Vastus medialis oblique and vastus lateralis activity during a double-leg semisquat with or without hip adduction in patients with patellofemoral pain syndrome. BMC Musculoskeletal Disorders. 2015; 16 (289): 1-8.

Giles LS, Webster KE, McClelland JA, Cook J. Atrophy of the Quadriceps Is Not Isolated to the Vastus Medialis Oblique in Individuals With Patellofemoral Pain. Journal of Orthopaedic & Sports Physical Therapy. August 2015; 45 (8): 613-619.

Sendur OF, Gurer G, Yildirim T, Ozturk E, Aydeniz A. Relationship of Q angle and joint hypermobility and Q angle values in different positions. Clinical Rheumatology. 2006; 25 (3): 304-308.

Powers CM. The influence of altered lower-extremity kinematics on patellofemoral joint dysfunction: A theoretical perspective. Journal of Orthopaedic & Sports Physical Therapy. 2003; 33 (11): 639-646.

Salsich GB, Perman WH. Patellofemoral joint contact area is influenced by tibiofemoral rotation alignment in individuals who have patellofemoral pain. Journal of Orthopaedic & Sports Physical Therapy. 2007; 37 (9): 521-528.

Noehren B, Pohl MB, Sanchez Z, Cunningham T, Lattermann C. Proximal and Distal Kinematics in Female Runners with Patellofemoral Pain. Clinical Biomechanics. May 2012; 27 (4): 366-371.

Horschig A, Sonthana K, Neff T. The Squat Bible: The Ultimate Guide to Mastering the Squat and Finding Your True Strength. Middletown, Delaware: Squat University LLC; 2017. 48, 71, 90-92, 99-102, 148-164.

Cook C, Hegedus E. Orthopedic Physical Examination Tests: An Evidence-Based Approach. Prentice Hall, 2008.

Pazzinatto MF, de Oliveira Silva D, Barton C, Rathleff MS, Briani RV, Micolis de Azevedo F. Female Adults with Patellofemoral Pain Are Characterized by Widespread Hyperalgesia Which Is Not Affected Immediately by Patellofemoral Joint Loading. Pain Medicine. 2016; 17: 1953-1961.

Lesher JD, Sutlive TG, Miller GA, Chine NJ, Garber MB, Wainner RS. Development of a clinical prediction rule for classifying patients with patellofemoral pain syndrome who respond to patellar taping. Journal of Orthopaedic & Sports Physical Therapy. 2006; 36 (11): 854-866.

Greenwood JLJ, Joy EA, Stanford JB. The Physical Activity Vital Sign: A Primary Care Tool to Guide Counseling for Obesity. Journal of Physical Activity and Health. 2019; 7: 571-576.

Waryasz GR, McDermott AY. Patellofemoral pain syndrome (PFPS): A systematic review of anatomy and potential risk factors. Dynamic Medicine. 2008; 7: 9.

Wilson T. The measurement of patellar alignment in patellofemoral pain syndrome: Are we confusing assumptions with evidence? Journal of Orthopaedic & Sports Physical Therapy. 2007; 37 (6): 330-341.

Aminaka N, Gribble PA. A systematic review of the effects of therapeutic taping on patellofemoral pain syndrome. Journal of Athletic Training. 2005; 40 (4): 341-351.

Logan CA, Bhashyam AR, Tisosky AJ, Haber DB, Provencher MT. Systematic Review of the Effect of Taping Techniques on Patellofemoral Pain Syndrome. Sports Health. 2017; 9 (5): 456-461.

Whittingham M, Palmer S, Macmillan F. Effects of taping on pain and function in patellofemoral pain syndrome: A randomized controlled trial. Journal of Orthopaedic & Sports Physical Therapy. 2004; 34 (9): 504-510.

Souza RB, Powers CM. Differences in Hip Kinematics, Muscle Strength, and Muscle Activation Between Subjects With and Without Patellofemoral Pain. Journal of Orthopaedic & Sports Physical Therapy. January 2009; 39 (1): 12-19.

Bolgla LA, Earl-Boehm J, Emery C, Hamstra-Wright K, Ferber R. Comparison of hip and knee strength in males with and without patellofemoral pain. Physical Therapy in Sport. 2015; 16: 215-221.

Santos TRT, Oliveira BA, Ocarino JM, Holt KG, Fonseca ST. Effectiveness of hip muscle strengthening in patellofemoral pain syndrome patients: a systematic review. Brazilian Journal of Physical Therapy. May-Junt 2015; 19 (3): 167-176.

Chinkulprasert C, Vachalathihi R, Powers CM. Patellofemoral Joint Forces and Stress During Forward Step-Up, Lateral Step-up, and Forward Step-down Exercises. Journal of Orthopaedic & Sports Physical Therapy. April 2011; 41 (4): 241-248.

Gross MT, Foxworth JL. The role of foot orthoses as an intervention for patellofemoral pain. Journal of Orthopaedic & Sports Physical Therapy. 2003; 33 (11): 661-670.

Vicenzino B, Franettovich M, McPoil T, Russell T, Skardoon G. Initial Effects of Anti-Pronation Tape on the Medial Longitudinal Arch During Walking and Running. British Journal of Sports Medicine. 2005; 39 (12): 939-943.

Behrangrad S, Kamali F. Comparison of ischemic compression and lumbopelvic manipulation as trigger point therapy for patellofemoral pain syndrome in young adults: A double blind randomized clinical trial. Journal of Bodywork & Movement Therapies. 2017; (21): 554-564.

Espí-López GV, Serra-Añó P, Vicent-Ferrando J et al. Effectiveness of Inclusion of Dry Needling in a Multimodal Therapy Program for Patellofemoral Pain: A Randomized Parallel-Group Trial. Journal of Orthopaedic & Sports Physical Therapy. June 2017; 47 (6): 392-401.

Timm KE. Randomized controlled trial of protonics on patellar pain, position, and function. Medicine & Science in Sports & Exercise. 1998; 30 (5): 665-670.