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REHABILITATION PROTOCOL: 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

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

Rehab Goals	<ul style="list-style-type: none"> ▪ 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 <ul style="list-style-type: none"> ○ 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	<p>During this early phase, numerous manual interventions may be utilized to reduce the patient’s pain, restriction to movement, and joint loading:</p> <ul style="list-style-type: none"> ▪ 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 <p>Range of motion/Mobility</p> <ul style="list-style-type: none"> • Stationary biking for tolerable mobility (minimal resistance) • Stretching/Foam rolling <ul style="list-style-type: none"> ○ Hip flexors ○ Hamstrings ○ Quadriceps ○ Iliotibial band ○ Adductors ○ Hip extensors/rotators ○ Gastroc-soleus complex <p>Strengthening</p> <ul style="list-style-type: none"> ▪ Quadriceps isometrics at 0, 45, 90 degrees of flexion ▪ Straight leg raises ▪ Bridge/unilateral bridging ▪ Side lying clamshells ▪ Side lying hip abduction ▪ Core/lumbopelvic stabilization (transverse abdominus, multifidus lifts, front/side planks)

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Criteria to Progress	<ul style="list-style-type: none"> ▪ 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
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PHASE II: INTERMEDIATE/ SUBACUTE (2-4 WEEKS)

Rehab Goals	<ul style="list-style-type: none"> ▪ 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	<p>Strengthening</p> <ul style="list-style-type: none"> ▪ Sumo walks ▪ Monster walks ▪ 4-way hip drills <p>Balance/proprioception</p> <ul style="list-style-type: none"> ▪ Single-leg stance ▪ Clock taps ▪ Ball toss <p>Correction of movement abnormalities with functional tasks</p>
Criteria to Progress	<ul style="list-style-type: none"> ▪ Tolerance to weightbearing activities ▪ Maintenance of full ROM ▪ Normalize muscle length or achieve muscle length goals

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

Rehab Goals	<ul style="list-style-type: none"> ▪ 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	<p>Strengthening</p> <ul style="list-style-type: none"> ▪ Partial squat, squat to chair, wall slide, progressing to functional squat pattern ▪ Lunge/reverse lunge ▪ Step ups

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Phase I-II Interventions	<ul style="list-style-type: none"> ▪ Step downs, eccentric loading <p>Correction of movement abnormalities with sport-related tasks</p> <p>Return to Running Program</p>
Criteria to Progress	<ul style="list-style-type: none"> ▪ Independent self-management of symptoms ▪ Demonstrate appropriate understanding of condition and maintenance to prevent risk of recurrence

**Acknowledgement: This rehab protocol was largely adopted from the protocols at MGH Sports Medicine Physical Therapy, which can be found at <https://www.massgeneral.org/orthopaedics/sports-medicine/physical-therapy/sports-rehab-protocols>*

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Return to Running Program

This program is designed as a guide for clinicians and patients through a progressive return-to-run program. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program (after a knee ligament or meniscus repair). Specific recommendations should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES Day 1 2 3 4 5 6

Day	1	2	3	4	5	6	7
Week 1	Walk 5 min, Jog 1 min x 5 reps		Walk 5 min, Jog 1 min x 5 reps		Walk 4 min, Jog 2 min x 5 reps		Walk 4 min, Jog 2 min x 5 reps
Week 2		Walk 3 min, Jog 3 min x 5 reps		Walk 3 min, Jog 3 min x 5 reps		Walk 2 min, Jog 4 min x 5 reps	
Week 3	Walk 2 min, Jog 4 min x 5 reps		Walk 1 min, Jog 5 min x 5 reps		Walk 1 min, Jog 5 min x 5 reps		Return to Run

**Only progress if there is no pain or swelling during or after the run

PHASE II: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES

Day	1	2	3	4	5	6	7
Week 1	20 min		20 min		20 min		25 min
Week 2		25 min		25 min		30 min	

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Week 3	30 min		30 min		35 min		35 min
Week 4		35 min		40 min		40 min	
Week 5	40 min		45 min		45 min		45 min
Week 6		50 min		50 min		50 min	
Week 7	55 min		55 min		55 min		60 min
Week 8		60 min		60 min			

Recommendations

- Runs should occur on softer surfaces during Phase I
- Non-impact activity on off days
- Goal is to increase mileage and then increase pace; avoid increasing two variables at once
- 10% rule: no more than 10% increase in mileage per week

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Agility and Plyometric Program

This program is designed as a guide for clinicians and patients through a progressive series of agility and plyometric exercises to promote successful return to sport and reduce injury risk. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program. Specific intervention should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: ANTERIOR PROGRESSION

Rehab Goals	<ul style="list-style-type: none"> ▪ Safely recondition the knee ▪ Provide a logical sequence of progressive drills for pre-sports conditioning
Agility	<ul style="list-style-type: none"> ▪ Forward run ▪ Backward run ▪ Forward lean in to a run ▪ Forward run with 3-step deceleration ▪ Figure 8 run ▪ Circle run ▪ Ladder
Plyometrics	<ul style="list-style-type: none"> ▪ Shuttle press: Double leg alternating leg single leg jumps ▪ Double leg: <ul style="list-style-type: none"> ○ Jumps on to a box jump off of a box jumps on/off box ○ Forward jumps, forward jump to broad jump ○ Tuck jumps ○ Backward/forward hops over line/cone ▪ Single leg (these exercises are challenging and should be considered for more advanced athletes): <ul style="list-style-type: none"> ○ Progressive single leg jump tasks ○ Bounding run ○ Scissor jumps ○ Backward/forward hops over line/cone
Criteria to Progress	<ul style="list-style-type: none"> ▪ No increase in pain or swelling ▪ Pain-free during loading activities ▪ Demonstrates proper movement patterns

PHASE II: LATERAL PROGRESSION

Rehab Goals	<ul style="list-style-type: none"> ▪ Safely recondition the knee ▪ Provide a logical sequence of progressive drills for the Level 1 sport athlete
Agility	<ul style="list-style-type: none"> ▪ Side shuffle ▪ Carioca ▪ Crossover steps

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*Continue with Phase I interventions	<ul style="list-style-type: none"> ▪ Shuttle run ▪ Zig-zag run ▪ Ladder
Plyometrics *Continue with Phase I interventions	<ul style="list-style-type: none"> ▪ Double leg: <ul style="list-style-type: none"> ○ Lateral jumps over line/cone ○ Lateral tuck jumps over cone ▪ Single leg (these exercises are challenging and should be considered for more advanced athletes): <ul style="list-style-type: none"> ○ Lateral jumps over line/cone ○ Lateral jumps with sport cord
Criteria to Progress	<ul style="list-style-type: none"> ▪ No increase in pain or swelling ▪ Pain-free during loading activities ▪ Demonstrates proper movement patterns

PHASE III: MULTIPLANAR PROGRESSION

Rehab Goals	<ul style="list-style-type: none"> ▪ Challenge the Level 1 sport athlete in preparation for final clearance for return to sport
Agility *Continue with Phase I-II interventions	<ul style="list-style-type: none"> ▪ Box drill ▪ Star drill ▪ Side shuffle with hurdles
Plyometrics *Continue with Phase I-II interventions	<ul style="list-style-type: none"> ▪ Box jumps with quick change of direction ▪ 90 and 180 degree jumps
Criteria to Progress	<ul style="list-style-type: none"> ▪ Clearance from MD ▪ Functional Assessment <ul style="list-style-type: none"> ○ Quad/HS/glut index $\geq 90\%$ contra lateral side (isokinetic testing if available) ○ Hamstring/Quad ratio $\geq 70\%$ ○ Hop Testing $\geq 90\%$ contralateral side ▪ KOOS-sports questionnaire $>90\%$ ▪ International Knee Committee Subjective Knee Evaluation >93 ▪ Psych Readiness to Return to Sport (PRRS)