

KNEE PATELLOFEMORAL PAIN NON-OPERATIVE GUIDELINE

The following Patellofemoral (PF) Pain Non-operative Guideline was developed by HSS Rehabilitation and is categorized into four phases, dependent on patient presentation and symptom irritability. Classification and progression are both criteria-based and individualized as determined by the clinician's evaluation and significant diagnostic findings. Phases and time frames are designed to give the clinician a general sense of progression. Identification of phase and progression is evaluation based, allowing the practitioner to deem what treatment is most appropriate. The clinician should balance appropriate interventions for the optimization of functional activities, while considering symptom irritability and the resolution of impairments. Additionally, progression through the phases and the maximum achievable phase should be in alignment with patient goals. Note that pathology and/or structural deficits may affect the patient's ideal level of activity.

FOLLOW REFERRING PROVIDER'S MODIFICATIONS AS PRESCRIBED

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Phase 1: Acute/High-Moderate Irritability

PRECAUTIONS

- Be mindful of differential diagnoses in the presence of joint effusion or multi-joint symptoms
- Avoid exercises and activities that are painful and/or exacerbate symptoms

ASSESSMENT

- Lower Extremity Functional Scale (LEFS), validated for ages 18+ years
- Pediatric International Knee Documentation Committee Subjective Knee Evaluation Form (Pedi-IKDC) validated for ages 10 -18 years
- IKDC, validated for ages 18+ years
- Fear Avoidance Beliefs Questionnaire (FABQ), validated for ages 18+ years
- Numeric pain rating scale (NPRS)
- Edema/Effusion
- Standing posture: lower extremity alignment
- Lumbar spine and hip screen
- Lower extremity active range of motion (AROM) and passive range of motion (PROM)
- Patellar alignment and patellar mobility/apprehension
- Palpation
 - Inferior pole of the patella
 - Mid patellar tendon
 - Tibial tuberosity
 - Medial and lateral patellar facets
 - Fat pads
 - Pes Anserine
- Quadriceps contraction
- Strength: handheld dynamometry (HHD) if available
 - Knee flexion
 - Hip flexion/extension/abduction/external rotation (ER)/internal rotation (IR)
 - Knee extension, avoiding pain provocation (perform at 60 degrees knee flexion to decrease potential irritability)
- Flexibility (1 and 2 joint muscles: hip flexors, hamstrings, quadriceps, gastrocnemius/soleus)
- Address footwear and inserts, if applicable
- Gait and transfers
- Single leg stance (pain, time, quality)

TREATMENT RECOMMENDATIONS

- Patient education
 - Understanding PF loads and activity modifications
 - Improve neuromuscular control/muscle activation
 - Standing posture
 - Deficits identified and plan of care including goals
- Manual treatment
 - Edema/effusion management
 - Lower extremity (LE) soft tissue and joint mobility
- Knee PROM/active assisted range of motion (AAROM)/AROM as needed
- Movement strategies (importance of hip strategy versus knee strategy)
- Proximal and distal stretching
- Strengthening
 - Quadriceps/hamstring isometrics, progress to isotonics as tolerated
 - Proximal and distal strengthening
 - Core stabilization
- Balance/proprioception training
- Modalities
 - External supports, as needed (bracing or taping)
 - Ice, compression, transcutaneous electrical nerve stimulation (TENS): to address pain and edema
 - Neuromuscular electrical stimulation (NMES), biofeedback, blood flow restriction (BFR) program with FDA approved device and qualified clinician
- Gait training with appropriate assistive device, if needed
- Home exercise program (HEP)
- Cardiovascular exercise (see Appendix 1- Cardiovascular exercises)

CRITERIA FOR ADVANCEMENT

- Pain controlled with ambulation on level surfaces with appropriate assistive device
- No effusion
- Pain well managed with activities of daily living (ADLs)
- If patient fails to demonstrate improvement in 4-6 weeks, refer back to referring provider

EMPHASIZE

- Patient understanding of condition/PF loading and activity modifications
- Normalize gait, with appropriate assistive device if necessary
- Control pain and edema/effusion
- Pain-free exercise and activities
- HEP compliance
- Active quadriceps contraction
- Cardiovascular exercise

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Phase 2: Sub-Acute/Moderate Irritability Phase

PRECAUTIONS

- Avoid exercises and activities that are painful and/or exacerbate symptoms

ASSESSMENT

- LEFS
- FABQ
- Pedi-IKDC
- IKDC
- NPRS
- Edema/Effusion
- Standing posture: lower extremity alignment
- Lumbar spine and hip screen
- LE AROM/PROM
- Patellar alignment/mobility/apprehension
- LE flexibility
- Strength Testing (HHD if available)
 - Knee flexion
 - Hip flexion/extension/abduction/ER/IR
 - Knee extension, avoiding pain provocation (perform at 60 degrees knee flexion to decrease potential irritability)
- Single leg stance
- Gait (see Appendix 2)
- Functional movement (squat, forward step up/step down)
- Address footwear and inserts, if applicable

TREATMENT RECOMMENDATIONS

- Patient education
 - Reinforce compliance with updated HEP
 - Movement strategies
- Address flexibility and ROM deficits
 - Soft tissue mobilization/massage therapy
 - Joint mobilization, as needed (patella, ankle, hip)
 - Foam rolling
 - Stretching

- Strengthening (see Appendix 3)
 - LE and core
- Neuromuscular control
 - Bilateral progressing to single limb balance
 - Focus on hip/knee/ankle control with single limb activities (see Appendix 3)
- Modalities
 - Continued external supports (bracing, taping, shoe inserts), as needed
 - Biofeedback, BFR, NMES for muscle activation/strengthening
- Progress HEP
- Cardiovascular training (see Appendix 2)

CRITERIA FOR ADVANCEMENT

- Pain well managed with activities and ADLs
- Able to complete single limb activities with good alignment and control
- Able to demonstrate a hip strategy for appropriate movements
- Normalized gait on level surfaces

EMPHASIZE

- Compliance with activity modification
- Edema/effusion and pain control
- Good neuromuscular control/alignment with single limb support
- Monitor onset of new pain/symptoms
- HEP compliance

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Phase 3: Chronic/Low Irritability Phase

PRECAUTIONS

- Monitor volume and load: avoid too much, too soon
- Avoid compensatory movement patterns, especially when fatigued

ASSESSMENT

- LEFS
- Pedi-IKDC
- IKDC
- NPRS
- Edema/Effusion
- Standing posture: lower extremity alignment
- Lumbar spine and hip screen
- LE AROM/PROM/flexibility
- Patellar alignment/mobility/apprehension
- Strength Testing (HHD if available)
 - Knee extension/flexion
 - Hip flexion/extension/abduction/ER/IR
- Gait
- Functional Movement
 - Squat
 - Forward step up/step down 6-8 inch step
 - Single leg squat
- Neuromuscular control
 - Dynamic single leg alignment and control
- Effects of fatigue on movement patterns
- Address ongoing efficacy of external supports (brace, shoe inserts, tape)

TREATMENT RECOMMENDATIONS

- Patient education
 - Reinforce compliance with updated HEP
 - Functional progression
 - Adequate rest and recovery
- Address flexibility and ROM deficits
 - Soft tissue mobilization/massage therapy
 - Joint mobilization, as needed (patella, ankle, hip)
 - Foam rolling
 - Stretching
- Strengthening progression
 - LE and core
 - Progressive resisted strengthening exercises
 - double leg to single leg exercise (e.g. deadlift to single leg deadlift)
- Functional strength
 - Squat progression
 - Stair progression
- Neuromuscular control
- Cardiovascular training via low/non-impact activities such as elliptical, bicycle, etc
- Aquatic therapy, if available (see Appendices 2, 4, and 5: aquatic therapy)
- Initiate return to running: antigravity treadmill if available

CRITERIA FOR DISCHARGE OR ADVANCEMENT TO PHASE 4 (IF RETURNING TO SPORT)

- Independent with control of symptoms
- Pain free with modified recreational activities and ADLs
- Able to demonstrate bilateral body weight squat with proper alignment and control
- Able to descend a 6-8 inch step with good control and alignment (dependent upon patient's height)
- Discharge to long term HEP or progress to Phase 4 if goal is to return to sport

EMPHASIZE

- Quality of movement with functional activities
- Progression of pain free PF loading
- Eccentric quadriceps control

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Phase 4: Return to Sport

PRECAUTIONS

- Monitor volume and load: avoid too much, too soon
- Avoid compensatory movement patterns
- Monitor movement strategies when fatigued
- Ensure adequate rest and recovery
- Optimize joint preservation

ASSESSMENT

- LEFS
- Pedi-IKDC
- NPRS
- Edema/Effusion
- Lumbar spine and hip screen
- ROM/Flexibility assessment
- Strength Testing (HHD if available)
 - Knee extension/flexion
 - Hip flexion/extension/abduction/ER/IR
- Gait: walking/running patterns in various conditions (uphill, downhill, uneven surfaces)
- Functional Movement (note strategies)
 - Squat
 - Forward step up/step down 6-8 inch step
 - Single leg squat
 - Jump in place
 - Jump side to side
- Neuromuscular control
 - Dynamic double leg and single leg movement patterns
- Effects of fatigue on movement patterns, quality and/or pain
- Modalities: address ongoing efficacy of external supports (brace, shoe inserts, tape)
- Functional movement screen
 - Quality of movement, e.g., symmetry, pain
 - Return to Sport Testing if available

TREATMENT RECOMMENDATIONS

- Progressively increase volume and PF load to mimic load necessary for return to activity
- Introduce & progress movement patterns specific to patient's desired sport or activity
- Introduce and progress agility work (see Appendix 5)
- Increase cardiovascular load to match that of desired activity
- Consider collaboration with certified performance specialist and/or coach for complex sports specific training, if available

CRITERIA FOR DISCHARGE

- Ensure that there is a plan in place for a graded return to full or modified activity based on patient's maximal therapeutic activity (e.g., performance specialist/coach)

EMPHASIZE

- Progression of pain-free PF loading
- Eccentric quadriceps control
- Movement quality with functional activities
- Readiness for sport

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Appendices

APPENDIX 1: PHASE 1

- Cardiovascular exercises
 - Upper body ergometer
 - Airdyne® or stationary bicycle
 - Swimming (use of pool buoy and avoidance of breaststroke)

APPENDIX 2: COMMON GAIT DEVIATIONS

- Lack of knee control resulting in knee hyperextension during stance
- Femoral internal rotation, valgus and/or increased pronation during stance
- Femoral internal rotation during swing
- Medial heel whip during swing
- Increased pelvic rotation with decreased hip extension

APPENDIX 3: PHASE 2 TREATMENT RECOMMENDATIONS

- For proximal muscle activation in single limb
 - Weight shifting medial/lateral, anterior/posterior to single limb stance
 - Proprioceptive board/wobble board
 - Contralateral hip extension and/or abduction
 - Hip hiking
 - Retro walking on treadmill or over ground
 - Single leg isometric leg press with slight knee flexion at less than body weight
- Emphasize hip strategy for movement
 - Initiate and continue to drive movement with the hips, e.g. hip hinging
- Core strengthening
 - Transverse abdominis activation in hooklying
 - Pallof press
 - Front planks
 - Side planks
- Gluteal strengthening
 - Bridge progression
 - Side lying hip abduction with ankle weight
 - Prone hip extension with ankle weight
 - Clamshell

- Closed chain quadriceps strengthening
 - Double limb to single limb leg press at less than bodyweight
- Body weight strengthening progression (start with double limb support). Consider continued use of BFR to address continued muscle activation or strength deficits.
 - Squat into chair
 - Romanian dead lifts
 - Band walks
 - Step ups
 - Step downs
- Ankle and foot
 - Heel raises
 - Intrinsic foot exercises
- Cardiovascular training
 - Increase volume before intensity (e.g. increase time before resistance)
 - Bicycle 80 RPM
 - Swimming, progress from pool buoy
 - Walking program
- Aquatic therapy
 - Address gait deviations (forward, retro ambulation)
 - Flexibility: address patient flexibility needs
 - Core stability: noodle push downs, med ball trunk rotation
 - Strengthening: sidesteps, standing leg lifts with ankle weights, double limb squats, step ups, standing hip/knee extension with noodle under foot, calf raises (if applicable utilizing laminar flow to provide resistance)
 - Balance: single limb stance activity with UE/LE movements

APPENDIX 4: PHASE 3 TREATMENT RECOMMENDATIONS

- Hydrotherapy
 - Progress step ups, step downs, prone hip kicking (flutter, hip abduction/adduction), single limb squats, lunges, progress intensity of single limb activity against laminar flow, initiate light aqua jogging

APPENDIX 5: PHASE 4 TREATMENT RECOMMENDATIONS

- Light agility: ladder, jump rope, anti-gravity treadmill, if able, at low intensity and low volume
- Hydrotherapy
 - Plyometrics: double and single leg jumps, jumping jacks, split stance hops, lateral push-offs, cariocas, sprinting to test patient tolerance for return to sports activity

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