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## **REHABILITATION PROTOCOL: Patella Dislocation (Nonoperative)**

This rehabilitation program is designed to return the individual to their activities as quickly and safely as possible. It is designed for rehabilitation following Non-Operative Patellar Dislocation. Modifications to this guideline may be necessary dependent on physician specific instruction, specific tissue healing timeline, chronicity of injury and other contributing impairments that need to be addressed. This evidence-based Non-Operative Patellar Dislocation Rehabilitation Guideline is criterion-based; time frames and visits in each phase will vary depending on many factors including patient demographics, goals, and individual progress. This guideline is designed to progress the individual through rehabilitation to full sport/ activity participation. The therapist may modify the program appropriately depending on the individual’s goals for activity following Non-Operative Patellar Dislocation.

This guideline is intended to provide the treating clinician a frame of reference for rehabilitation. It is not intended to substitute clinical judgment regarding the patient’s post injury care, based on exam/treatment findings, individual progress, and/or the presence of concomitant injuries or complications. If the clinician should have questions regarding progressions, they should contact the referring physician.

### **Considerations**

- General healing timeline expected: 10 – 16 weeks
- Immobilization versus mobilization following a patellar dislocation is a controversial topic at the moment. In a study by, Maenpaa and Lehto compared immediate mobilization to that of immobilization for 6 weeks. Immediate mobilization has 3-fold higher risk of re-dislocation compared to that of immobilization. Immobilization for 6 weeks did result in greater risk in knee ROM restriction. This guideline will be dependent on whether immobilization is done for 3 or 6 weeks.

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**PHASE I: ACUTE PHASE (0-6 WEEKS AFTER INJURY)**

<b>Rehab Goals</b>	<ul style="list-style-type: none"> <li>▪ Protect surgical site</li> <li>▪ Reduce swelling, minimize pain</li> <li>▪ Restore full extension, gradually improve flexion &gt; 90 deg</li> <li>▪ Minimize arthrogenic muscle inhibition, re-establish quad control, regain full active extension</li> <li>▪ Patient education               <ul style="list-style-type: none"> <li>○ Keep your knee straight and elevated when sitting or lying down. Do not rest with a towel placed under the knee</li> </ul> </li> </ul>
<b>Weight Bearing</b>	<p>Walking</p> <ul style="list-style-type: none"> <li>▪ Immobilize knee in knee brace at 0 degrees with use of crutches with WBAT for 4-6 weeks. Begin to unlock brace at 4 weeks according to available pain free ROM.</li> <li>▪ May start walking without crutches as long as there is no increased pain, effusion, and proper gait</li> <li>▪ When climbing stairs, make sure you are leading with the non-surgical side when going up the stairs, make sure you are leading with the crutches and surgical side when going down the stairs</li> <li>▪ Discontinue use of brace after 6 wks (or per surgeon) and when gait is normalized</li> </ul>
<b>Interventions</b>	<p><b>Swelling Management</b></p> <ul style="list-style-type: none"> <li>▪ Ice, compression, elevation</li> <li>▪ Retrograde massage</li> <li>▪ <a href="#">Ankle pumps</a></li> </ul> <p><b>Range of motion/Mobility</b></p> <ul style="list-style-type: none"> <li>▪ PROM</li> <li>▪ Heel slides with towel</li> <li>▪ Low intensity, long duration extension stretches: prone hang, heel prop</li> <li>▪ Seated hamstring/calf stretch</li> <li>▪ <a href="#">Stationary bicycle</a></li> <li>▪ Gentle patellar mobilizations: superior/inferior and medial/lateral <b>*Not necessary unless stiffness present</b></li> </ul> <p><b>Strengthening</b></p> <ul style="list-style-type: none"> <li>▪ <a href="#">Calf raises</a></li> <li>▪ <a href="#">Quad sets</a> <ul style="list-style-type: none"> <li>○ NMES high intensity (2500 Hz, 75 bursts) supine knee extended 10 sec/50 sec, 10 contractions, 2x/wk during sessions—use of clinical stimulator during session, consider home units distributed immediate post op</li> </ul> </li> <li>▪ <a href="#">Straight leg raise</a> <ul style="list-style-type: none"> <li>○ <b>**Do not perform straight leg raise if you have a knee extension lag</b></li> </ul> </li> <li>▪ <a href="#">Hip abduction</a></li> </ul>

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	<ul style="list-style-type: none"> <li>▪ Standing hamstring curl</li> <li>▪ Adductor strengthening: hook lying ball squeezes, SLR adduction, bridging with ball squeeze</li> <li>▪ Ball squats, wall slides, mini squats from 0-60</li> </ul> <p><b>Balance/proprioception</b></p> <ul style="list-style-type: none"> <li>▪ Single leg standing balance (knee slightly flexed) static progressed to dynamic and level progressed to unsteady surface</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>▪ No swelling (Modified Stroke Test)</li> <li>▪ Flexion ROM &gt;90 deg</li> <li>▪ Extension ROM equal to contra lateral side</li> <li>▪ Quad contraction with superior patella glide and full active extension</li> <li>▪ Able to perform straight leg raise without lag</li> </ul>

**PHASE II: INTERMEDIATE PHASE (4-9 WEEKS AFTER INJURY)**

<b>Rehab Goals</b>	<ul style="list-style-type: none"> <li>▪ Continue to protect injury site</li> <li>▪ Maintain full ROM</li> <li>▪ Safely progress strengthening</li> <li>▪ Promote proper movement patterns</li> <li>▪ Avoid post exercise pain/swelling</li> <li>▪ Avoid activities that produce pain at injury site</li> </ul>
<b>Weight Bearing</b>	<ul style="list-style-type: none"> <li>▪ FWB without assistive device</li> </ul>
<b>Additional Interventions</b> *Continue with Phase I Interventions	<p><b>Range of motion/Mobility</b></p> <ul style="list-style-type: none"> <li>▪ Gentle stretching all muscle groups: <a href="#">prone quad stretch</a>, <a href="#">standing quad stretch</a>, <a href="#">kneeling hip flexor stretch</a></li> </ul> <p><b>Cardio</b></p> <ul style="list-style-type: none"> <li>▪ ~8 weeks: Elliptical, stair climber, flutter kick swimming, pool jogging</li> </ul> <p><b>Strengthening</b></p> <ul style="list-style-type: none"> <li>▪ Gym equipment:             <ul style="list-style-type: none"> <li>○ <a href="#">leg press machine</a></li> <li>○ <a href="#">seated hamstring curl machine</a> and hamstring curl machine</li> <li>○ <a href="#">hip abductor and adductor machine</a></li> <li>○ <a href="#">hip extension machine</a></li> <li>○ <a href="#">roman chair</a></li> <li>○ <a href="#">seated calf machine</a></li> </ul> </li> <li>▪ Progress intensity (strength) and duration (endurance) of exercises</li> </ul> <p>**The following exercises to focus on proper control with emphasis on good proximal stability</p> <ul style="list-style-type: none"> <li>▪ Proximal Strengthening:</li> </ul>

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	<ul style="list-style-type: none"> <li>○ Double leg bridge</li> <li>○ Bridge with feet on physioball</li> <li>○ Single leg bridge</li> <li>○ Lateral band walk</li> <li>○ Standing clamshell/fire hydrant</li> <li>○ Hamstring walkout</li> <li>○ TA brace with UE and LE progression</li> <li>▪ <a href="#">Squat to chair</a></li> <li>▪ <a href="#">Lateral lunges</a></li> <li>▪ <a href="#">Romanian deadlift</a></li> <li>▪ Single leg progression:           <ul style="list-style-type: none"> <li>○ <a href="#">partial weight bearing single leg press</a></li> <li>○ slide board lunges: <a href="#">retro</a> and <a href="#">lateral</a></li> <li>○ <a href="#">step ups</a> and <a href="#">step ups with march</a></li> <li>○ <a href="#">lateral step-ups</a></li> <li>○ <a href="#">step downs</a></li> <li>○ <a href="#">single leg squats</a></li> <li>○ <a href="#">single leg wall slides</a></li> </ul> </li> <li>▪ Lateral band walks</li> </ul> <p><b>Balance/proprioception</b></p> <ul style="list-style-type: none"> <li>▪ Static Proprioception: 3-12 weeks           <ul style="list-style-type: none"> <li>○ Static wobble board, dyna disc, Bosu ball, cone touch</li> </ul> </li> <li>▪ Dynamic Proprioception: 4-12 weeks           <ul style="list-style-type: none"> <li>○ Agility drills, hopping, forward and backward lunges</li> </ul> </li> <li>▪ Progress single limb balance including perturbation training</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>▪ No effusion/swelling/pain after exercise</li> <li>▪ Normal gait</li> <li>▪ ROM equal to contra lateral side</li> <li>▪ Quad/HS/glut index <math>\geq 70\%</math>; HHD mean or isokinetic testing @ 60d/s</li> </ul>

**PHASE III: ADVANCED (9-12 WEEKS AFTER INJURY)**

<b>Rehab Goals</b>	<ul style="list-style-type: none"> <li>▪ Maintain full ROM</li> <li>▪ Safely progress strengthening</li> <li>▪ Promote proper movement patterns</li> <li>▪ Avoid post exercise pain/swelling</li> <li>▪ Avoid activities that produce pain</li> </ul>
<b>Additional Interventions</b> *Continue with	<p><b>Strengthening</b></p> <ul style="list-style-type: none"> <li>▪ Progress intensity (weight) and volume (repetitions) of exercises</li> </ul> <p><b>Plyometric activities</b></p>

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Phase II-II interventions	<ul style="list-style-type: none"> <li>▪ Bilateral FWB plyometrics progressed to single leg plyometrics</li> <li>▪ Progressively increase loads of plyometrics from this phase until return to sport:               <ul style="list-style-type: none"> <li>○ POGOS: double and single leg</li> <li>○ Box jump up:</li> <li>○ Box hop up</li> <li>○ Even ground jumps</li> <li>○ Even ground hops</li> <li>○ Drop jumps</li> <li>○ Drop hops</li> <li>○ Depth jumps</li> <li>○ Depth hops</li> </ul> </li> <li>▪ Power movements:               <ul style="list-style-type: none"> <li>○ Power clean</li> <li>○ Power snatch</li> <li>○ Med ball slam variations</li> <li>○ Push press</li> <li>○ Banded jumps</li> </ul> </li> </ul> <p><b>Balance/proprioception</b></p> <ul style="list-style-type: none"> <li>▪ Progress single limb balance including perturbation training</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>▪ Clearance from MD and ALL milestone criteria below have been met</li> <li>▪ Functional Assessment               <ul style="list-style-type: none"> <li>○ Quadriceps index &gt;80%; HHD or isokinetic testing 60d/s</li> <li>○ Hamstrings ≥80%; HHD or isokinetic testing 60 d/s</li> <li>○ Glut med, glut max index ≥80% HHD</li> </ul> </li> </ul>

**PHASE IV: RETURN TO SPORT (10-16 WEEKS AFTER INJURY)**

<b>Rehab Goals</b>	<ul style="list-style-type: none"> <li>▪ Safely progress strengthening</li> <li>▪ Safely initiate sport specific training program</li> <li>▪ Promote proper movement patterns</li> <li>▪ Avoid post exercise pain/swelling</li> <li>▪ Avoid activities that produce pain at injury site</li> </ul>
<b>Additional Interventions</b> *Continue with Phase II-IV interventions	<p><b>Strengthening</b></p> <ul style="list-style-type: none"> <li>▪ Progress intensity (weight) and volume (repetitions) of exercises</li> </ul> <p><b>Interval running program</b></p> <ul style="list-style-type: none"> <li>▪ Return to Running Program (See below)</li> </ul> <p><b>Progress to plyometric and agility program (with functional brace if prescribed)</b></p> <ul style="list-style-type: none"> <li>▪ Agility and Plyometric Program (See below)</li> <li>▪ Multi-plane sport specific plyometrics program</li> </ul>

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	<ul style="list-style-type: none"> <li>▪ Multi-plane sport specific agility program</li> <li>▪ Include hard cutting and pivoting depending on the individuals' goals</li> <li>▪ Non-contact practice→ Full practice→ Full play (~6-7 mo)</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>▪ Clearance from MD and ALL milestone criteria below have been met</li> <li>▪ Completion jog/run program without pain/effusion / swelling</li> <li>▪ Functional Assessment             <ul style="list-style-type: none"> <li>○ Quad/HS/glut index ≥95%; HHD mean or isokinetic testing @ 60d/s</li> <li>○ Hamstring/Quad ratio ≥66%</li> <li>○ Hop Testing ≥95% compared to contra lateral side, demonstrating good landing mechanics</li> </ul> </li> <li>▪ Lysholm &gt;90%</li> <li>▪ KOOS-sports questionnaire &gt;90%</li> <li>▪ International Knee Committee Subjective Knee Evaluation &gt;93</li> <li>▪ Psych Readiness to Return to Sport (PRRS)</li> <li>▪ Kujala &gt; 90</li> </ul>

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

### PHASE II: LATERAL PROGRESSION

Rehab Goals	<ul style="list-style-type: none"> <li>▪ Safely recondition the knee</li> <li>▪ Provide a logical sequence of progressive drills for the Level 1 sport athlete</li> </ul>
Agility *Continue with Phase I interventions	<ul style="list-style-type: none"> <li>▪ Side shuffle</li> <li>▪ Carioca</li> <li>▪ Crossover steps</li> <li>▪ Shuttle run</li> </ul>

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

**PHASE III: MULTIPLANAR PROGRESSION**

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