ACL CLINICAL PRACTICE GUIDELINE

Disclaimer

- Progression is time and criterion-based, depending on soft tissue healing, patient demographics, and clinician evaluation.
- For questions, contact Dr. Sujan Gogu's clinic.

Precaution

1. ***Before 8 weeks:*** No ligament testing (Lachman, Anterior/Posterior Drawer, Varus/Valgus Stress)

2. ***For 8 weeks:*** No isotonic resisted hamstring exercises for 8 weeks with hamstring autograft

3. ***For 8 weeks:*** No loaded open kinetic chain knee extension beyond 45 degrees

4. Meniscus Repair:

- ***For 8 weeks:*** No weight-bearing (WB) therapeutic exercise >90º
- ***For 4 weeks:*** PWB
- ***For 4 weeks:*** No forced flexion beyond 90º

Outcome Tools

Collect at initial evaluation, monthly, and discharge. Be consistent with the tool used each time.

1. IKDC

2. KOOS

3. ACL-RSI

4. Tegner

Strength Testing

1. **Isometric Testing:** Anytime, fixed at 90º
2. **Isokinetic Testing:** No earlier than 12 weeks

Criteria to Discharge Assistive Device	
1. ROM: Full active knee extension; no pain on passive overpressure	**2. Strength:** Strong quad isometric with full tetany and superior patellar glide; 2x10 SLR without quad lag
3. **Effusion:** Prefer 1+ or less (2+ acceptable if other criteria are met)	**4**. **Weight Bearing:** Pain-free ambulation without visible gait deviation

Criteria for Return to Sport	
ROM	Full, pain-free knee ROM, symmetrical with the uninvolved limb
Strength	Isokinetic testing 90% or greater for hamstring and quad at 60º/sec and 300º/sec
Effusion	No reactive effusion ≥ 1+ with sport-specific activity
Weight Bearing	Normalized gait and jogging mechanics
Neuromuscular Control	Appropriate mechanics and force attenuation strategies with high-level agility, plyometrics, and high-impact movements
Functional Hop Testing	LSI 90% or greater for all tests
Physician Clearance	Clearance from Physician is necessary

Early Post-Operative Phase (Post-ACLR – 4 Weeks)	
Appointments	• **Initial Evaluation:** 3-5 days following surgery. • **Follow-up Appointments:** 1-2 times per week, depending on progression towards goals.
Precautions	**1. Ligament Testing:** No testing of repaired or reconstructed ligaments (Lachman, Anterior/Posterior Drawer, Varus/Valgus Stress) prior to 12 weeks. **2. Loaded Open Kinetic Chain Knee Extension:** No loaded open kinetic chain knee extension for 8 weeks. **3. Meniscus Repair:** • No weight-bearing (WB) therapeutic exercise >90º

	for 8 weeks. • Partial weight-bearing (PWB) for 4 weeks. • No forced flexion beyond 90º for 4 weeks.
Pain and Effusion	• **Effusion Level:** ≥ 2+ (using Modified Stroke Test). • **Management:** Cryotherapy and compression (e.g., donut, ace wrap), and limited weight-bearing therapeutic exercise.
Range of Motion (ROM)	• **Extension:** Emphasis on achieving full knee extension immediately. If full extension is not achieved by 4 weeks, contact the surgeon. • **Flexion:** No forced flexion past 90º for meniscus repairs. ACLR and meniscectomy can push for symmetrical flexion as appropriate.
Therapeutic Exercise Goals	• **Quad Activation:** Emphasis on quad activation without gluteal co-contraction. • **Patellar Mobility:** Restore patellar mobility. • **Symmetrical ROM:** Achieve symmetrical ROM. • **Effusion Management:** Decrease effusion. • **Ambulation:** Ensure appropriate joint loading and ambulation without obvious gait deviation.
Suggested Interventions	• **Extension ROM:** Bag hangs, prone hangs. • **Flexion ROM:** Heel slides, wall slides, upright bike. • **Patellar Mobilization:** Superior, inferior, medial, lateral. • **Quad Isometrics and SLR:** Quad isometrics, SLR in four directions. • **Terminal Knee Extension (TKE):** Prone and standing. • **Leg Adduction/Abduction (LAQ):** To maintain mobility.

	• **Balance and Weight Shifting:** Weight shifting, single-leg balance. • **Neuromuscular Re-Education:** NMES at 60º knee flexion.
NMES Parameters	• **Pads Placement:** On proximal and distal quadriceps. • **Patient Position:** Seated with knee in at least 60º flexion, shank secured with strap, back support with thigh strap preferred. Ankle pad/belt should be two finger widths superior to the lateral malleoli. • **Stimulation Parameters:** 10-20 seconds on, 50 seconds off x 15 minutes. Aim for at least 50% of max volitional contraction or maximal tolerable amperage without knee joint pain.
Criteria to Discharge Assistive Device	• **ROM:** Full active knee extension; no pain on passive overpressure. • **Strength:** Able to perform strong quad isometric with full tetany and superior patellar glide; 2x10 SLR without quad lag. • **Effusion:** Preferably 1+ or less (2+ acceptable if other criteria are met). • **Weight Bearing:** Pain-free ambulation without visible gait deviation.

Criteria to Progress to Middle Phase of Rehab	• **ROM:** ≥ 0-120 degrees.
	• **Strength:** Quadriceps set with normal superior patellar translation, SLR x 10 seconds without extensor lag.
	• **Goals:**
	  • **Effusion:** 2+ or less with Modified Stroke Test.
	  • **Weight Bearing:** Able to tolerate closed

	kinetic chain (CKC) therapeutic exercise program without increased pain and ≤ 2+ effusion.

Middle Phase of Rehabilitation (4-12 Weeks)	
Appointments	• **Frequency:** 1-2 visits per week. • **Focus:** Increase lower extremity strength. Emphasize patient compliance with a resistance training home exercise program (HEP) 2-3 days per week outside of therapy.
Precautions	• **Open Chain Knee Extension:** ➢ Initiate submaximal leg extension from 90-45 degrees. ➢ Initiate active knee ROM from 90-0 degrees (modify if painful). • **Hamstring Strengthening:** No isolated resisted hamstrings strengthening until 8 weeks.
Pain and Effusion	• **Management:** Use cryotherapy and compression as needed for reactive effusion. • **Patellar Taping:** To reduce patellofemoral (PF) symptoms if present.
Range of Motion (ROM)	• **Monitoring:** Track and progress knee ROM, patellar mobility, and lower extremity (LE) flexibility. • **Techniques:** Begin more aggressive techniques to achieve/maintain full knee extension (e.g., weighted bag hang) as needed. • **Bike Use:** Continue bike for ROM and warm-up. • **Consult Surgeon:** If full active ROM (AROM) knee

	extension is not achieved by 4 weeks.
Suggested Interventions and Timelines	• **Multi-Angle Isometrics:** From 60-90 degrees for patients unable to tolerate high-intensity NMES. • **Open Chain Knee Extension Exercises:** ➢ Unweighted full range leg extension (LAQ). ➢ Protected range with isotonic progression. • **Weight-Bearing Exercises:** ➢ Progress quadriceps and hamstring exercises with an emphasis on proper LE mechanics (no isolated hamstring strengthening until 8 weeks). ➢ Progress gluteal and lumbopelvic strength and stability. • **Balance:** Progress single-leg balance exercises. • **Endurance:** Low-impact activities like treadmill walking, stepper, elliptical (from 6 weeks). • **Plyometrics:** Initiate partial weight-bearing (PWB) plyometrics on shuttle (8-10 weeks). Follow precautions to begin full weight-bearing plyometrics. • **NMES:** Continue as per parameters established in weeks 1-4.
Criteria to Discontinue NMES	• **Quadriceps Deficit:** <20% on isometric or isokinetic testing OR **1.** 10 straight leg raises (SLR) without quadriceps lag. **2.** Normal gait. **3.** 10 heel taps to 60 degrees with good quality. **4.** 10 rep max on leg press (LP) and similar effort bilaterally.

	5. Inability to break quadriceps manual muscle test (MMT).
Criteria to Initiate Running and Jumping	**1. ROM:** Full, pain-free knee ROM, symmetrical with the uninvolved limb. **2. Strength:** Isokinetic testing ≥80% for hamstring and quadriceps at 60º/sec and 300º/sec. **3. Effusion:** 1+ or less. **4. Weight Bearing:** Normalized gait and jogging mechanics. **5. Neuromuscular Control:** Pain-free hopping in place.
Criteria to Progress to Late Phase of Rehab	**1. ROM:** Maintain full, pain-free AROM including patellofemoral (PF) mobility. **2. Effusion:** 1+ or less. **3. Strength:** Isometric or isokinetic quadriceps and hamstrings strength ≥80%. **4. Weight Bearing:** Able to tolerate therapeutic exercise program, including jogging progression, without increased pain or >1+ effusion. **5. Neuromuscular Control:** Demonstrates proper lower extremity mechanics with all therapeutic exercises (bilaterally). **6. Outcome Tools:** Score ≥7/10 on the IKDC Questionnaire.

Late Phase of Rehabilitation (Weeks 12 - Return to Sport)	
Appointments	• **Frequency:** Increase to 1-2x per week, as appropriate, to initiate plyometric training and return to running program.
Precautions	• **Criteria to Initiate Hopping:** ➢ Full, pain-free ROM. ➢ Effusion ≤ 1+. ➢ IKDC Questionnaire score ≥ 7/10.

	➢ 80% isometric strength symmetry (hamstrings and quadriceps) or 20 heel touches on an 8-inch step with good mechanics. • **Criteria to Initiate Jogging (in addition to above criteria):** ➢ Hop downs with appropriate landing mechanics. ➢ Audible rhythmic strike patterns and no gross visual compensation.
Pain and Effusion	**Management:** Effusion may increase with increased activity. Ensure ≤1+ and/or non-reactive effusion before progressing with plyometrics.
Range of Motion (ROM)	**Monitoring:** Ensure ROM is full, symmetrical with the contralateral limb, and pain-free with overpressure.
Therapeutic Exercise	**Focus Areas:** • Performance of quadriceps, hamstrings, and trunk dynamic stability. • Muscle power generation and absorption via plyometrics. • Sport- and position-specific activities. • Agility exercises between 50-75% effort with visual feedback to improve mechanics. • Advanced plyometrics: Progress from bilateral to single-leg, altering surfaces, adding ball tosses, and 3D rotations.
Suggested Interventions	
Therapeutic Exercise/Neuromuscular Re-Education	**Exercises:** • Squats, leg extension, leg curl, leg press, deadlifts, lunges (multi-direction), crunches, rotational trunk exercises on static and dynamic surfaces, monster

	walks. • Partial weight-bearing (PWB) to full weight-bearing (FWB) jumping. • Single-leg squats on BOSU with manual perturbation, single-leg BOSU balance, single-leg BOSU Romanian deadlift.
Agility	Side shuffling, carioca, figure 8, zig-zags, resisted jogging (Sports Cord) in straight planes, backpedaling.
Plyometrics:	• Single-leg hop downs from increasing height (up to 12-inch box), single-leg hop-holds. • Double and single-leg hopping onto unstable surfaces, double and single-leg jump-turns. • Repeated tuck jumps.
Criteria for Return to Sport	1. **ROM:** Full, pain-free knee ROM, symmetrical with the uninvolved limb. 2. **Strength:** Isokinetic testing ≥90% for hamstring and quadriceps at 60º/sec and 300º/sec. 3. **Effusion:** No reactive effusion ≥1+ with sport-specific activity. 4. **Weight Bearing:** Normalized gait and jogging mechanics. 5. **Neuromuscular Control:** Appropriate mechanics and force attenuation strategies with high-level agility, plyometrics, and high-impact movements. 6. **Functional Hop Testing:** Limb Symmetry Index (LSI) ≥90% for all tests. 7. **Physician Clearance:** Obtain clearance before full return to sport.