

YOUR ACL PRE-SURGERY PROGRAM A GUIDE TO PHYSICAL THERAPY

THE ROLE OF PHYSICAL THERAPY IN YOUR RECOVERY

Before ACL reconstruction, a structured pre-surgery program makes a real difference. Research shows that patients who complete prehabilitation — getting the knee straight, activating the quad, and controlling swelling before surgery — have significantly better outcomes at two and ten years than those who go straight to the operating room. The goals are simple and sequenced: full knee straightening first, then quad activation, then strength.

Important: Surgery is not scheduled until your knee is ready. Your therapist and Dr. Merritt communicate directly about your readiness timeline — do not rush this phase.

YOUR RECOVERY TIMELINE

PHASE	TIMEFRAME	PT VISITS	WHAT YOU'RE WORKING ON
1	Days 0–14 Post-Injury	2–3× per week	• Control swelling — ice 20 min every 2 hours, elevate • Get your knee fully straight — the single most important goal • Activate your quad — electrical stimulation if needed • Protect the knee — no pivoting, cutting, or twisting
2	Weeks 2–6	2× per week	• Build quad strength — squats, leg press, step-ups • Stationary bike for range of motion and conditioning • Single-leg balance and proprioception work • Reach strength and motion criteria before surgery is scheduled
3	Week 6+ (Pre-op check)	As needed	• Confirm full knee straightening — equal to the other side • Confirm quad strength meets surgical readiness criteria • Swelling fully controlled • Cleared by Dr. Merritt to proceed with surgery

Questions about your pre-surgery program? Call our office or bring them to your next visit. We coordinate directly with your therapist to make sure you are ready.

ACL PRESURGICAL REHABILITATION — PHYSICAL THERAPY PROTOCOL

Patient Name: _____ **Surgeon:** Andrew L. Merritt, MD
Date of Surgery: _____ **PT Start Date:** _____

Overview & General Principles

This protocol guides rehabilitation of the ACL-deficient knee from the time of injury until surgery. The evidence is unambiguous: patients who complete structured prehabilitation before ACL reconstruction have significantly better 2-year and 10-year outcomes than those who proceed directly to surgery. (Delaware-Oslo ACL Cohort, Grindem et al. — 2-year KOOS superiority across all subscales; maintained at 10-year follow-up.) The goals are full extension, quad activation, effusion control, and strength — in that priority order. Surgery should not be scheduled until readiness criteria are met. PT and Dr. Merritt should communicate directly around readiness timeline.

- Full passive and active knee extension — matching the contralateral side — is the single most important presurgical goal; patients entering surgery with a flexion contracture are at significantly higher risk of post-operative stiffness and second surgery
- Effusion (swelling) causes arthrogenic muscle inhibition (AMI) — the quad cannot be fully activated when the knee is swollen; effusion must be controlled before meaningful strength gains are possible
- Quad activation precedes quad strengthening — the quad must fire voluntarily before it can be loaded; do not advance to loaded exercises until a solid quad set is achievable
- The ACL-deficient knee is at risk for further injury — avoid pivoting, cutting, twisting, and contact sports until after surgery
- Blood flow restriction (BFR) training: approved and valuable when pain or effusion limits heavier loading in Phase 1 and early Phase 2
- Cold compression therapy: compression cryotherapy unit used aggressively for effusion management — 20 min on/off multiple times per day, especially after exercise
- Psychological readiness matters: patients who complete prehab arrive at surgery with better body awareness, less fear, and familiarity with their post-op exercises — this transfers directly to recovery

PHASE 1 — Acute Management (Days 0–14 Post-Injury)

INFORMATION FOR THE PATIENT — What to Expect This Phase

Your most important job right now is getting your knee fully straight. A knee that won't straighten going into surgery is the leading cause of stiffness after surgery — and stiffness after ACL reconstruction can require a second procedure and leads to inferior results. Ice and compress your knee constantly to control swelling. Swelling is what prevents your quad from firing normally, so the faster you control it, the sooner you can start building strength. No pivoting, cutting, or sports until after your surgery.

Goals:

- Restore full passive knee extension — equal to contralateral side
- Reduce effusion to trace or absent
- Restore volitional quadriceps activation — quad set with visible VMO contraction
- Achieve straight leg raise (SLR) without extension lag
- ROM: work toward 90°+ flexion without forcing

- Normalize gait — walk without a limp before advancing

Weight-Bearing Status:

- Weight-bearing as tolerated (WBAT) — crutches if needed for pain or instability
- Advance to full weight-bearing without assistive device as pain and swelling allow
- The ACL-deficient knee is mechanically stable enough for walking; crutch use should be minimized as soon as comfortable

Range of Motion:

- EXTENSION IS THE TOP PRIORITY — full passive extension equal to contralateral knee by end of Week 1
- Method: heel props over rolled towel; prone hanging 10–15 min 2–3×/day; gravity-assisted extension
- Flexion: heel slides and active-assisted ROM; progress toward 90° without forcing
- Patellar mobilizations (all 4 directions): begin Day 1 — prevents early adhesion formation
- Do not force flexion if it increases effusion

Bracing:

- Hinged ACL brace or knee immobilizer: use for ambulation if giving-way episodes occur
- Brace is for safety and comfort — not required if quad control is adequate and gait is stable
- Discontinue brace for exercise and ROM work

Exercises:

- Quad sets: isometric quad activation against a rolled towel — every waking hour; this is the most important exercise of Phase 1
- Straight leg raises (SLR): begin when quad set achievable; 3 × 15 — no extension lag required
- Heel props and prone knee hanging: passive extension — 10–15 min sessions, 2–3×/day
- Patellar mobilizations: superior, inferior, medial, lateral — 2 min each direction, 2×/day
- Heel slides: supine active-assisted flexion — stop at pain or resistance; 3 × 15
- Hip strengthening: SLR all 4 planes, clamshells, sidelying abduction — maintain limb strength
- Ankle pumps: 20 reps/hour — reduces distal swelling
- BFR training: quad sets and SLR with BFR cuff — valuable if significant quad inhibition prevents meaningful voluntary activation
- Cold compression therapy: 20 min on/off after all exercise and 2–3× daily at rest; elevate above heart level when possible

Progression Milestones:

- Full passive extension (0°) equal to contralateral knee
- Effusion reduced to trace or absent
- Quad set: visible/palpable VMO contraction
- SLR without extension lag
- Walking without significant limp

PRECAUTIONS — Phase 1

- No pivoting, cutting, twisting, or lateral sports movements — the ACL-deficient knee lacks the primary restraint against anterior tibial translation and rotational load; a secondary injury (meniscus tear, cartilage damage) will complicate surgery and recovery
- Do not force knee extension with aggressive stretching — gentle, sustained, gravity-assisted extension is more effective and safer than forced mobilization

- Do not progress to strengthening exercises until effusion is controlled — swelling actively inhibits quad firing through arthrogenic muscle inhibition; loading a swollen knee produces poor strength gains and worsens the effusion
- No contact sports or return to competition before surgery

PHASE 2 — Strengthening & Neuromuscular Training (Weeks 2–6 or until Surgery Readiness Criteria met)

INFORMATION FOR THE PATIENT — What to Expect This Phase

Your swelling is under control and your quad is firing — now it's time to build strength. Research shows that patients who build quad and hamstring strength before ACL surgery recover faster and return to sport at higher rates than those who go straight to surgery. You're not just waiting for surgery; you're making it work better. Continue to avoid any movements that could re-injure the knee — one more injury before surgery can add months to your recovery.

Goals:

- Achieve quad strength $\geq 80\%$ LSI (target $\geq 90\%$ if timeline allows)
- Achieve hamstring strength $\geq 80\%$ LSI
- Full pain-free ROM equal to contralateral knee
- Restore single-leg balance and neuromuscular control
- Normalize gait and functional movement patterns
- Psychological readiness for surgery and post-operative rehab

Weight-Bearing Status:

- Full weight-bearing throughout Phase 2
- Progress to single-leg activities when strength and control allow

Range of Motion:

- Full symmetrical ROM is the target — equal to contralateral knee in both extension and flexion
- Stationary bike: excellent tool for ROM maintenance and quad/hamstring conditioning
- If any extension deficit persists, continue prone hanging and heel props daily until fully resolved

Bracing:

- Functional ACL brace optional for higher-demand activities during this phase
- Brace does not need to be worn during PT exercises

Exercises:

- Stationary bike: 15–20 min, progressive resistance — ROM and conditioning
- Leg press: bilateral then unilateral progression; 3 × 10–15
- Mini squats (0° – 60°) and step-ups (4–6 inch): bilateral progressing to single-leg
- Hamstring curls: seated or prone, progressive resistance; 3 × 15
- Romanian deadlifts: eccentric hamstring loading; 3 × 10
- Nordic hamstring curls (if tolerated): eccentric emphasis; strongest evidence for hamstring strength
- BFR training: leg press, squats, hamstring curls — effective when pain or apprehension limits heavy loading; allows meaningful strength stimulus at low resistance

- Single-leg balance: 30–60 seconds; progress to eyes-closed and perturbation
- Balance board / Bosu: double-leg then single-leg; proprioceptive retraining
- Lateral band walks and hip strengthening: glute and hip abductor emphasis
- Calf raises: bilateral to single-leg; 3 × 20
- Gait and movement quality: address any persistent limp, Trendelenburg, or compensatory patterns

Progression Milestones:

- Quad strength $\geq 80\%$ LSI (testing recommended at Week 4–5)
- Hamstring strength $\geq 80\%$ LSI
- Full ROM equal to contralateral knee
- Single-leg stance 60 seconds without significant balance deficit
- Walking and stair negotiation without pain or compensatory gait
- Patient verbalizes understanding of post-operative protocol expectations

PRECAUTIONS — Phase 2

- No pivoting, cutting, or lateral agility sports — ACL is still absent; a secondary meniscus tear or cartilage injury before surgery significantly worsens the surgical complexity and post-operative timeline
- No contact sports or return to team practice before surgery
- Do not advance to plyometrics unless surgery is being delayed beyond 8–10 weeks and strength criteria are met — plyometric loading of an ACL-deficient knee carries secondary injury risk; discuss with Dr. Merritt if applicable
- Monitor effusion — if swelling returns with loading, reduce intensity and return to Phase 1 effusion management before continuing

Rationale: The Delaware-Oslo ACL Cohort demonstrates that patients completing structured prehabilitation have superior 2-year KOOS outcomes across all subscales and maintain this advantage at 10 years. Quad strength symmetry at the time of surgery is an independent predictor of post-operative strength recovery and return-to-sport rate. Every percentage point of quad LSI gained before surgery translates to a faster and more complete recovery after surgery.

SURGERY READINESS CRITERIA

Criteria for Surgery:

- Knee extension: full passive AND active extension equal to contralateral side (0° deficit)
- Knee flexion: within 10° of contralateral knee (typically $125^\circ+$)
- Effusion: trace to absent — no significant joint swelling at rest
- Quadriceps: no extension lag on SLR; strength $\geq 80\%$ LSI (goal $\geq 90\%$ if timeline allows)
- Hamstring strength: $\geq 80\%$ LSI
- Weight-bearing: full, without assistive device; gait normalized
- Single-leg stance: 30+ seconds without significant instability
- Psychological readiness: patient understands post-operative protocol and has realistic expectations
- Formal clearance: Dr. Merritt reviews readiness criteria before scheduling surgery

Functional Testing:

- ROM assessment: compare passive and active extension bilaterally; measure flexion bilaterally
- Effusion assessment: clinical exam (ballottement, stroke test) — trace or absent required
- Quad strength: handheld dynamometry or functional assessment; SLR quality
- Single-leg stance: timed, eyes open then eyes closed

- Gait assessment: observe for limp, Trendelenburg, or antalgic pattern

Clinical Note

• Surgery should not be scheduled until extension and effusion criteria are met at minimum. Patients who go into surgery with a flexion contracture — even mild (5°) — have substantially higher rates of post-operative stiffness requiring manipulation under anesthesia or revision surgery. If a patient cannot meet extension criteria within 4–6 weeks of injury, communicate with Dr. Merritt to discuss barriers and adjust timeline. There is no evidence that delaying surgery by 2–4 weeks to achieve prehab goals worsens outcomes; the evidence consistently shows the opposite.

Surgeon Notes / Special Instructions: