

ACL Rehab Guidelines

Patient _____

Date _____

Involved side ☐ L ☐ R

Isolated ACL Reconstruction (without meniscus repair or other ligamentous repair)

This protocol details general guidelines for ACL rehab with some key exercises/goals in each phase. It should not replace a clinician's professional judgment or assessment of individual patient needs. If you are an outside therapist and have questions, please contact us.

Wake Forest Baptist Health, Sports Medicine Phone: (336) 713-6038

Clinic/Gym Exercise Program — PHASE I

Weeks 0–2 Post-Op · 2–3 x per week

Goals

- Work toward full knee extension
- Active Range of Motion Knee Flexion > 90 deg by 2 weeks
- Good quadriceps contraction
- Good seated Straight Leg Raise

Warm up

Bike

Proprioception training

Double and Single Leg Balance

Avoid hyperextension. Avoid trunk/pelvis/LE compensations. Quads engaged. Static and Dynamic.

Gait training

Look for phases of gait

Good heel strike, loading, push-off. Full terminal knee extension without hyperextension

Weight Shifting

To facilitate progressive weight-bearing without compensation

Strength training

Quad Sets

Use biofeedback and/or NMES (Neuromuscular Electrical Stimulation)

Terminal Knee Extension

Focus on regaining good terminal knee extension. WB and NWB. Quad Sets. Prone quad sets. Standing TKE.

Proximal Strengthening

Sidelying/supine hip abd/add, prone hip ext, isometrics

Leg Press

<= 30deg knee flexion

Prone knee flexion

Active motion only, avoid pain. * Not with hamstring graft.

B Heel Raises

Straight Leg Raise

Assisted at first. Do not start until able to perform good quad set. May modify position (ie standing/sitting).

Mini Squats

0–30deg

Manual therapy

Patellar mobilizations

As needed

Stretching

Heel Slides

Active, Active Assisted, Passive

Others as needed

CLINICAL NOTES

Early emphasis should be on regaining full knee extension and improving quad contraction/quad control.

Brace locked in extension until patient demonstrates good quad set, good control with weight-shifting exercises, and able to perform single leg stance for at least 5 sec.

With hamstring autograft: NO resisted hamstring strengthening or hamstring isometrics.

No active or resisted OKC Knee Extension before week 2.

Use modalities, including vasopneumatic compression, as indicated, to decrease edema and pain.

ACL Rehab Guidelines

Clinic/Gym Exercise Program — PHASE II

Weeks 2–4 Post-Op · 2–3 x per week

Goals

- Full passive knee extension
- Active Range of Motion Knee Flexion > 110 deg
- Good Straight Leg Raises (no quad/extensor lag)
- Good MINI Squat 0–45 deg without compensation or weight shift
- Walk without brace or crutches

Warm up

Bike

Proprioception / balance

Double and Single Leg Balance Avoid hyperextension. Avoid trunk/pelvis/LE compensations. Quads engaged. Static and Dynamic. Progress difficulty.

Gait training

Look for phases of gait Good heel strike, loading, push-off. Full terminal knee extension without hyperextension

Strength training

Regain full active TKE	Quad Sets w/ heel towel roll, SAQ, Stand TKE, prone quad sets, etc.
Squats	Shallow depth. May use unstable surface such as rocker board. Equal/symmetrical WB, good mechanics, good quad control. Mirror and cues. Avoid knee-forward posture.
Step Exercises	Avoid compensations (trunk/pelvis/LE). No more than 2–4 inches initially. Forward Step-Ups, Lateral Step-Ups
Proximal Strengthening	Sidelying/supine hip abd/add, prone hip ext, isometrics
Leg Press	Single Leg, Partial ROM
Seated Leg Extension	Start with AROM only; 30–40deg block (from full ext) with resistance
B Heel Raises	
Bridges	Look for pelvis symmetry/equal height
Hamstrings	Prone, Standing, Seated (no leg curl machine yet). Caution with resistance with Hamstring graft for first 6 weeks

Manual therapy

Scar / patella / soft tissue Gentle scar mobilization, patellar mobilization, soft tissue mobilization as indicated

Stretching

Knee Flexion / Heel Slides	Active, Active Assisted, Passive
Others as needed	

CLINICAL NOTES

A strong emphasis should be placed on quad control and looking for quad avoidance.
 Work on technique and avoiding trunk/pelvis/LE compensations.
 Caution with quadriceps strengthening and watch for anterior knee pain.
 NO knee flexion resistance with hamstring graft.
 Use modalities, including vasopneumatic compression, as indicated, to decrease edema and pain.

ACL Rehab Guidelines

Clinic/Gym Exercise Program — PHASE III

Weeks 5–8 Post-Op · 2–3 x per week

Goals

- Full Active Knee Extension
- Active Range of Motion Knee flexion <10% deficit vs. uninvolved
- Normal Gait Pattern with good terminal knee extension
- Able to perform > 6 inch step-up and >4 inch step down with good control, minimal/no pain

Warm up

Bike	
Elliptical, Stairmaster	Consider at 6–8 weeks post-op, start with low intensity/duration

Proprioception / balance

Double and Single Leg Balance	Avoid hyperextension, trunk/pelvis/LE compensations. Quads engaged. Static and Dynamic. Progress difficulty: Foam, BOSU, Minitramp, Rocker Board, etc.
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Gait training

Normalize gait pattern

Strength training

Squats	>= 45deg. May use unstable surface such as rocker board. Equal/symmetrical WB, good mechanics, good quad control. Mirror and cues.
Leg Press	Single Leg
Step Exercises	Forward Step-Ups, Lateral Step-Ups, Step Downs
Seated Leg Extension	30–40deg block (from full extension) with resistance
Hamstrings	Caution with resistance with Hamstring graft. Prone Leg Curls, Double Leg Swiss Ball Hamstrings
B Heel Raises	Emphasize progression of repetitions, emphasize high reps
Bridges	Single leg progression when LE and core control demonstrated
Lunges	Weeks 6–8. Start with partial range, stationary. Progress to walking.

Stretching

Knee Flexion / Heel Slides	Active, Active Assisted, Passive
Others	Quadriceps, Hamstrings, Calves, and Others as needed

CLINICAL NOTES

A strong emphasis should be placed on quad control and looking for quad avoidance.
 Work on technique and avoiding trunk/pelvis/LE compensations.
 Do not neglect working on good strength and control with terminal knee extension in weight bearing.
 With proper healing of incisions, may utilize aquatic therapy as indicated.
 Caution with quadriceps strengthening and watch for anterior knee pain.
 Caution with knee flexion resistance with hamstring graft.
 Use modalities, including vasopneumatic compression, as indicated, to decrease edema and pain.

ACL Rehab Guidelines

Clinic/Gym Exercise Program — PHASE IV

Weeks 9–12 Post-Op · 2–3 x per week

Goals

- Full Active Knee Extension
- Full active assisted knee flexion
- Quadriceps strength < 25–30% deficit vs. uninvolved
- Able to perform single leg squat, 10 reps, 40deg knee flex, with good biomechanics/balance

Warm up

Bike, Elliptical, Stairmaster	Increase duration/intensity to improve endurance. Encourage endurance training outside of the clinic: bike, elliptical, swimming, etc.
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Proprioception / balance

Double and Single Leg Balance	Avoid hyperextension, trunk/pelvis/LE compensations. Quads engaged. Static and Dynamic. Progress difficulty: Foam, BOSU, Minitramp, Rocker Board, etc.
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Gait training

Normalize gait pattern

Strength training

Squats	<= 100deg knee flex. May use unstable surface. Equal/symmetrical WB, good mechanics, good quad control.
Leg Press	Single Leg: 100–0 deg knee flexion
Step Exercises	Forward Step-Ups, Lateral Step-Ups, Step Downs
Seated Leg Extension	30–40 deg block (from full knee ext) with resistance
Hamstrings	Prone Leg Curls, Double Leg Swiss Ball Hamstrings
Single leg Heel Raises	Emphasize progression to high reps
Bridges	Single leg progression when LE and core control demonstrated
Lunges	Walking Lunges, Split Squats
Sidestepping with theraband	Avoid hip/pelvis compensations
Core and Proximal Strengthening	As indicated
Pre-Agility / Pre-Plyometric	No jumping. Small controlled movements. Drop lands: heel raise then quickly drop to squat. Progress to small 2-legged hops, then 6 in drop lands.

Biodex isokinetic training (if available)

Prerequisite	Tolerate pain-free isotonic prior to isokinetics
Workouts	Start with 180–300 deg/sec. 30 deg block until 12 wks.
Test	60, 180, 300 deg/sec at 12 wks

Stretching

Heel Slides	Active, Active Assisted, Passive
Others	Quadriceps, Hamstrings, Calves, and Others as needed
Prone child's pose	Prayer stretch / heel sit

CLINICAL NOTES

A strong emphasis should be placed on quad control and looking for quad avoidance.

Work on technique and avoiding trunk/pelvis/LE compensations.

With proper healing of incisions, may utilize aquatic therapy as indicated.

ACL Rehab Guidelines

Clinic/Gym Exercise Program — PHASE V: Pre-Sport Training

Months 4 to 6 post-op · 2–4 x / month

Goals

- Full Knee AROM
- Quadriceps and Hamstrings <15% deficit vs. uninjured with isokinetic test, especially 60deg/sec (or 10-rep max)
- Hop Tests < 15% deficit vs. uninjured
- Good control with sport specific drills, running, cutting, jumping
- Review expectations and correlate with patient status. 12–18 years old: 9–12 mo; 18+ years old: 6–12 mo.

Warm up

Bike, Elliptical, Stairmaster	Increase duration/intensity. Encourage endurance training outside of the clinic.
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Proprioception / balance

Higher level	Activity specific as indicated.
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Gait training

Normal gait pattern	
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Strength training

Continue as indicated	Full ROM resisted OKC knee extension as tolerated. May use eccentrics. Progress with activity / job / sport specific strengthening.
Home program	Do not stop strengthening when you start agility/sport specific drills. Emphasize home program.

Agility and plyometric training

Progression	Begin with slower, controlled movements. Good LE biomechanics and control of body weight over plant leg. Do not begin prematurely. Do not allow excess compensation. If unsure how to progress, ask the surgeon and/or an experienced PT.
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Biodex isokinetic training (if available)

Test	60, 180, 300 deg/sec
Goals	<15% deficit on involved knee. 66% hamstring/quadriceps ratio, peak torque, at 180 deg/sec

Functional testing · see Appendix A

Drills	Noyes Hop Tests, Drop Land on single leg, Cutting drills, Sport-specific drills
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Stretching

As indicated	
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CLINICAL NOTES

A very strong emphasis should be placed on a progressive, independent home program since the patient may be seen less frequently as this stage progresses. Jogging only after good, pain-free controlled CKC exercises, basic hopping drills, and isokinetic testing < 30% deficit vs. uninjured. Perform good single leg 6 in drop lands. Start with a walk/jog program.

Sport specific training should progress gradually and only with sufficient strength and control. Jumping should not begin until good control is demonstrated with step-ups, hopping drills, and drop lands from heel-raise position.

ACL Rehab Guidelines

Clinic/Gym Exercise Program — PHASE VI: Return to Sport

Months 6 to 12 post-op · 2–4 x / month

Goals

- Full Knee AROM
- Quadriceps and Hamstrings strength <10% deficit vs. uninvolved with isokinetic testing (or 10-rep max)
- Hop Tests < 10% deficit vs. uninvolved
- Good control with sport specific drills, running, cutting
- Review expectations and correlate with patient status; 12–18 years old: 9–12 mo, 18+ years old: 6–12 mo

Warm up

Bike, Elliptical, Stairmaster	Increase duration/intensity. Encourage endurance training outside of the clinic.
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Proprioception / balance

Higher level	Activity specific as indicated.
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Gait training

Normal gait pattern	
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Strength training

Do not neglect	Continue as indicated. Full ROM resisted OKC knee extension as tolerated. Progress with activity / job / sport specific strengthening.
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Agility and plyometric training

Progression	Begin with slower, controlled movements. Good LE biomechanics, alignment, and control of body weight over plant leg. Do not begin prematurely. Do not allow excess compensation.
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Biodex isokinetic training (if available)

Test	60, 180, 300 deg/sec
Goals	< 10% deficit at all speeds. 66% hamstring/quadriceps ratio, peak torque, at 180 deg/sec

Functional testing · see Appendix A

Drills	Noyes Hop Tests, Drop Land on single leg (good control 6–12 in), Cutting drills, Sport-specific drills
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Stretching

As indicated	
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CLINICAL NOTES

Phase VI Goals must be achieved for patient to receive clearance for return to sport.

A very strong emphasis should be placed on a progressive, independent home program since the patient may be seen less frequently as this stage progresses.

Isokinetic testing should show < 10% deficit vs. uninvolved side at all speeds, especially 60deg/sec.

Sport specific training should progress gradually and only with sufficient strength and control.

Specific focus on acceleration and deceleration drills for running.

ACL Rehab Guidelines

LOWER EXTREMITY TESTING — FINAL PHASE FUNCTIONAL GOALS

Single Leg Hop for distance

- Patient must stick the landing. Give 2 practice hops.
- Final score is average of 3 completed reps. No more than 6 attempts maximum.
- Measure in meters to 2 decimal places. Calculate LSI (leg symmetry index).

Timed 6 meter Hop

- Give patient 1 practice attempt on each leg at 75% speed.
- Final score is average of 3 reps. Calculate LSI (leg symmetry index).

Cross-over Triple Hop for distance

- Must stick landing on final hop and only single contact on initial 2 hops.
- Give patient 1 practice at 75% effort. Average of 3 completed reps. No more than 6 attempts.
- Measured in meters to 2 decimal places. Calculate LSI (leg symmetry index).

Timed Triple Lateral Hop Drill

- Give patient 1 practice attempt. Average of 3 completed reps. No more than 6 attempts.
- Calculate LSI (leg symmetry index).

Sport-specific hopping, jumping, and agility drills

- Observe and note: Symmetry; Quality of Movement (alignment and biomechanical control); Speed.

TESTING ORDER

If functional testing is performed on the same day as isokinetic testing, the isokinetic testing will be performed first.

This standardizes the procedure. Fatigue from isokinetic testing helps simulate fatigue the athlete will feel when jumping, running, and cutting.

ACL Rehab Guidelines

ISOKINETIC TESTING GUIDELINES

1. Warm-up on bike × 6 min

2. Perform warm-up exercises

Leg Press	Single leg, light to moderate weight, 1 set of 15 reps on each leg
Leg Extension	Single leg, light to moderate weight, 1 set of 15 reps on each leg
Leg Curls	Single leg, light to moderate weight, 1 set of 15 reps on each leg

3. Educate the patient

Educate patient on isokinetic test expectations, effort needed, and test protocol.

4. Perform isokinetic testing

- Uninvolved lower extremity tested first, followed by involved lower extremity
- Knee Extension/Flexion, Concentric/Concentric

60 deg/sec	5 reps, × 2
180 deg/sec	15 reps, × 1
300 deg/sec	25 reps, × 1

Set range of motion

- Extension: 30deg block until 12 wks post-op, then set to ~15deg block (“full”). Patient comfort/“full” active ext with positioning on machine.
- Flexion: usually 95–105deg, set to comfort with positioning on machine.
- ROM may be adjusted to avoid pain or for other reasons based on clinician's discretion.
- Allow a few practice reps at each speed to give them a feel for resistance and ROM.
- Be sure that patient uses the full range of motion on each leg.
- Give patient 30 sec rest time between each set.
- Keep test the same between legs (same rest time, same number of practice reps).

TESTING ORDER

If functional testing is performed on the same day as isokinetic testing, the isokinetic testing will be performed first. This standardizes the procedure and helps simulate fatigue the athlete will feel with jumping, running, and cutting.

ACL Rehab Guidelines

Family Guide

What to expect after: Anterior Cruciate Ligament (ACL) Reconstruction

ACL reconstruction is an effective and safe surgical procedure to allow return to pre-injury status, including returning to work, recreation, and competitive sports. Our team of rehabilitation specialists at Wake Forest Baptist Health is dedicated to assisting you with all your needs throughout the different phases of recovery after ACL reconstruction. We understand that this can be a long process with many obstacles and pressure to return by a certain date (i.e. the start of the next sports season), so we are providing this Family Guide to help you understand how we progress through the phases of rehab to ensure the highest level of safety while progressing as quickly as possible.

The most important concept to know is that progression from one phase to another, and ultimately return to sports, cannot be based on a calendar date from surgery. Healing takes time, so we may not progress before a certain date, or time frame, from surgery. Physical performance will determine readiness to progress through rehab. We use a variety of standard measurements of joint motion, flexibility, balance, strength, and running/cutting/jumping drills to determine your current level of overall function.

Formerly, the accepted goal to return to sports was around 6 months from surgery; however, recent trends changed expectations for certain populations. Younger individuals are undergoing ACL reconstruction, greatly increasing the number of 6–17 year old patients. Unfortunately, early return to sport in younger patients is linked to an increase in re-injuries to either the same knee or the opposite knee. Here is some recent research that investigates return to sport considerations.

- There is a wide range of return to sport time frames. Although some high school, college and professional athletes may return as early as 6 months, the average time to return for most athletes is 10 months (Nwachukwu 2017, Dekkers 2017).
- Up to 35% of patients aged 6–17 may suffer a second ACL tear (same or opposite leg). Earlier return to sport (< 9 months) was the only predictor of future risk. (Dekkers 2017).
- Returning to sport without passing specific functional tests (<10% deficit) can lead to a 4 times higher incident of re-injury (Kyritsis 2016).

ACL Rehab Guidelines

Sports Physical Therapy Treatment Guidelines — HIGHLIGHTS

These are general guidelines and are not comprehensive. Surgeon and Physical Therapist judgement take precedence, and patients will require clearance to progress through each phase of rehab.

Phase I (0–2 weeks) — Protective Phase

- Primary goals: regain knee extension (knee straight), regain control of the quadriceps muscle (front of thigh), begin bending the knee, and begin walking with weight on the surgical leg.
- There may be some limitations to weight bearing or bending the knee if other procedures were performed during the surgery.
- Regular work on a progressive home exercise program (prescribed by your physical therapist) will be essential to make good progress throughout the rehab process.

Phase II (2–4 weeks) — Walking

- Patients should gain full passive knee extension.
- Get cleared by PT to transition off of crutches for daily walking.
- Some patients may be able to progress out of the brace and begin driving at this phase, but they must demonstrate sufficient strength and balance.

Phase III (4–8 weeks) — Daily Function

- Normal walking pattern and nearly full return of knee motion.
- Walking up/down stairs with good strength and control.
- Perform moderate/heavy strengthening without pain.

Phase IV (9–12 weeks) — Progressive Strengthening

- Progress strengthening, including: knee, ankle, hip, and core.
- Develop aerobic conditioning with non-impact exercises.
- Begin “pre-running” exercises. NO running before 12 weeks.

Phase V (4–6 months) — Pre-Sport Training

- Focus on building strength and endurance.
- Initial strength test: either single leg 10-rep max or Biodex isokinetic testing comparisons between legs demonstrating < 30% deficit comparing surgical leg to uninvolved leg.
- Land on one leg from a 6 in. box demonstrating correct form.
- Begin straight line jogging program once above goals have been met.
- Begin some controlled sport specific movements, supervised and guided by your physical therapist.

Phase VI (6–12 months) — Return to Sport

- You can expect to be fit for an ACL knee brace prior to return to sport.
- Strong emphasis on higher level jumping/landing, running, plyometrics, and advanced sport-specific drills.
- Must pass standard functional testing before release for unlimited sports participation, including single leg hop tests <10% deficit and knee isokinetic testing < 10% deficit.
- Due to significant decrease in frequency of PT visits, regular work on a progressive home exercise program will be especially important during this phase.