# ACL Injury, Reconstruction, and Rehabilitation Guide

SANFORD
ORTHOPEDICS
SPORTS MEDICINE

Welcome to Sanford Orthopedics and Sports Medicine. It is a privilege to care for you. Your doctor has told you that you have an ACL (Anterior Cruciate Ligament) injury. We hope this information is helpful as you learn about your injury, reconstruction, and rehabilitation.

If you have any questions, please ask any of the Sanford Orthopedics and Sports Medicine Team.

# Table of Contents

# Anatomy of the Knee

The knee is a hinge joint, formed where the thighbone (femur) and the shinbone (tibia) meet. It is the largest joint in the body. The joint is covered with smooth tissue and powered by large muscles.

When all the parts listed below are healthy, a knee should move easily:

- Articular cartilage is a layer of smooth tissue. It covers the ends of the thighbone and shinbone. It also lines the back side of the kneecap. Healthy cartilage absorbs stress and allows the knee to bend easily.
- Muscles power the knee and leg for movement.
- Tendons attach the muscles to the bones.
- Ligaments are bands of tissue that connect bones and brace the joint.
- Bones that make up your knee joint include:
  - **Tibia:** This is the shinbone or larger bone of the lower leg.
  - **Femur:** This is the thighbone or upper leg bone.
  - **Patella:** This is the kneecap.

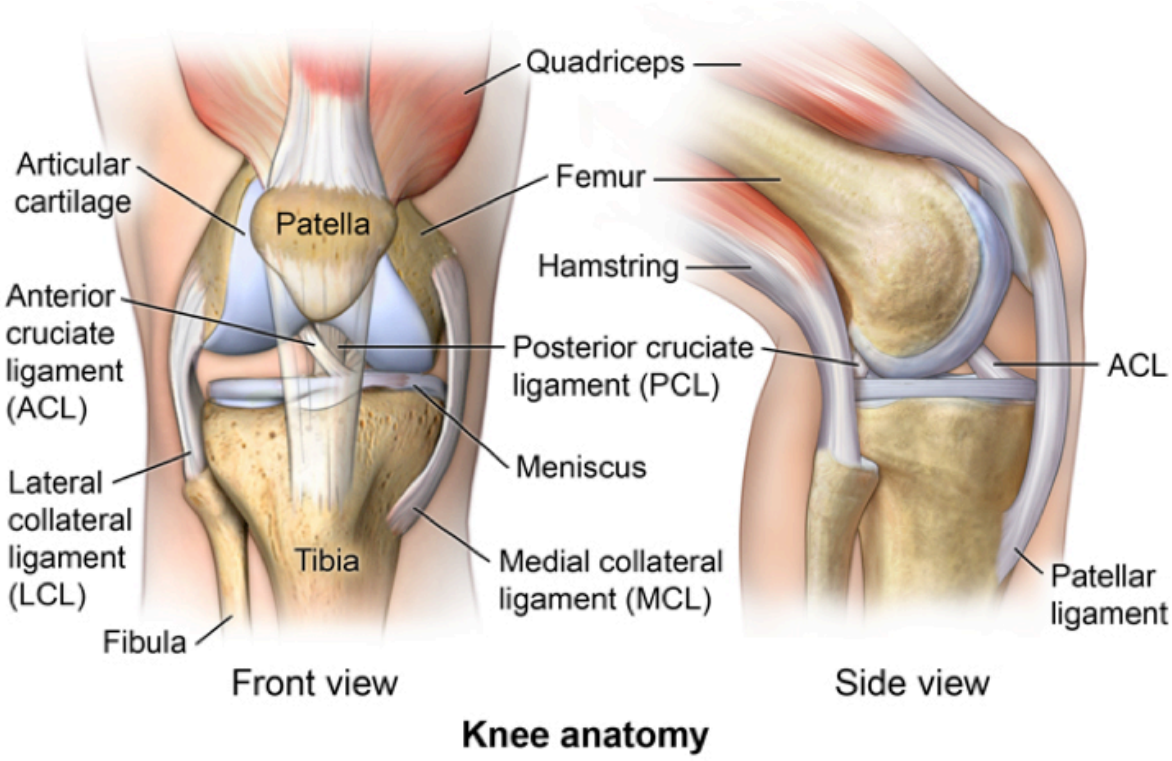
Sitting between the tibia and femur are two pads of cartilage called the medial meniscus (men- is kus) and the lateral meniscus. Menisci are 2 wedge shaped pieces of cartilage that absorb shock between the thighbone and shinbone. Another job of the menisci, along with the ligaments, is to help keep the knee stable.

Ligaments are elastic bands of tissue that connect bones to each other and provide stability and strength to the joint. The 4 main ligaments in the knee connect the femur (thighbone) to the tibia (shinbone), and include:

- **Anterior cruciate ligament (ACL):** The ligament in the center of the knee that controls rotation and forward movement of the tibia (shinbone).
- **Posterior cruciate ligament (PCL):** The ligament in the back of the knee that controls backward movement of the tibia (shinbone).
- **Medial collateral ligament (MCL):** The ligament that gives stability to the inner knee.
- **Lateral collateral ligament (LCL):** The ligament that gives stability to the outer knee.

The ACL is located in the center of the knee along with the PCL. The ACL (anterior cruciate ligament) is a band of tough, fibrous tissue that helps stabilize the knee. The ACL's primary functions are to:

- Prevent the tibia from sliding forward under the femur.
- Control the amount of rotation in the knee joint.




**Knee anatomy**

# Understanding Your Knee Injury

A healthy knee bends easily and rotates slightly. The joint absorbs stress and moves smoothly. This allows you to walk, squat, and turn without pain.

The anterior cruciate ligament (ACL) is one of the most common ligaments of the knee to be injured. Injury to this ligament often happens when the knee is forced beyond its normal range of motion. This can stretch or tear the ligament, much like the fibers of a rope coming apart. The ACL is often stretched and/or torn during a sudden twisting motion (when the feet stay planted one way, but the knees turn the other way). Skiing, basketball, soccer and football are sports that have a higher risk of ACL injuries.

## Symptoms

The symptoms of ACL injury may look like other conditions or medical problems. Always see your doctor for a diagnosis. People that have an ACL injury describe similar symptoms. Each individual may experience symptoms differently. These symptoms may be:

- Feeling or hearing a pop in the knee at the time of injury
- Sudden leg buckling or "giving out" when trying to stand on it
- Pain on the outside and back of the knee
- Increased swelling within the first few hours of the injury
- Limited knee movement because of swelling and/or pain

## Other Injuries

ACL tears rarely are the only injury. Some other injuries may include:

- Damage to the ligament-like structure that holds the kneecap in place (retinaculum)
- Breakdown of the cartilage (chondral injuries) and/or bone under the cartilage (osteochondral injuries)
- Swelling or injury to the soft tissues around the knee joint:
  - Medial or lateral meniscus
  - Posterior cruciate ligament (PCL) tear
  - Medial collateral ligament (MCL) tear
  - Lateral collateral ligament (LCL) tear
- Other injuries to the leg bones: bone contusions or bone bruises

If you had another injury with your ACL tear, this may change the standard ACL rehabilitation guideline timeframe for certain exercises. Your rehabilitation expert will be aware of this after surgery to make the recommended changes to your rehabilitation plan of care.

# Types of Reconstructive Surgery

Surgery for an ACL reconstruction involves replacing the torn ACL with tissue called a graft (new tissue). This is done when tendon tissue is taken from another part of the body. There are different types of grafts used in reconstruction of the ACL. Your surgeon will select which graft to use based on your age, activity level, graft selection sites, and past medical history.

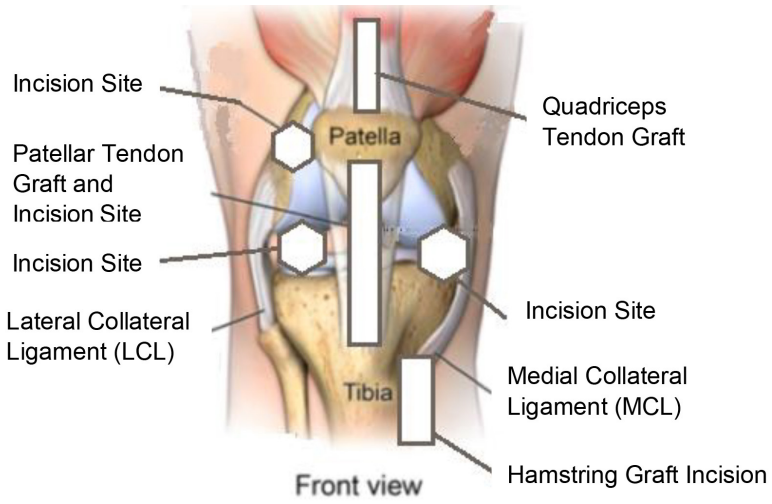
### Autograft (Tissue Taken From Your Own Body)

This uses any one of several tendons from your body

- **Hamstring Tendon Graft** uses a part of your own hamstring tendon between the hamstring muscle and the tibia.
- **Patellar Tendon Graft** uses the middle third of your own patellar tendon between the knee cap and tibia.
- **Quadriceps Tendon Graft** uses a part of your own quadriceps tendon between the knee cap and quadriceps muscle.

### Allograft (Tissue Taken From a Donor)

This uses any one of several tendons from a cadaver.



# After Your Injury

Whether or not you have surgery, rehabilitation exercises are important. Your doctor may recommend a supervised session with a rehabilitation expert before surgery. An important goal is to have full range of motion, little swelling, and improving strength. You will be told how long and how often to exercise.

The rehabilitation expert will help make a plan to:

- Improve your knee range of motion
- Increase your strength
- Decrease swelling
- Improve functional mobility (movement)
- Decrease pain

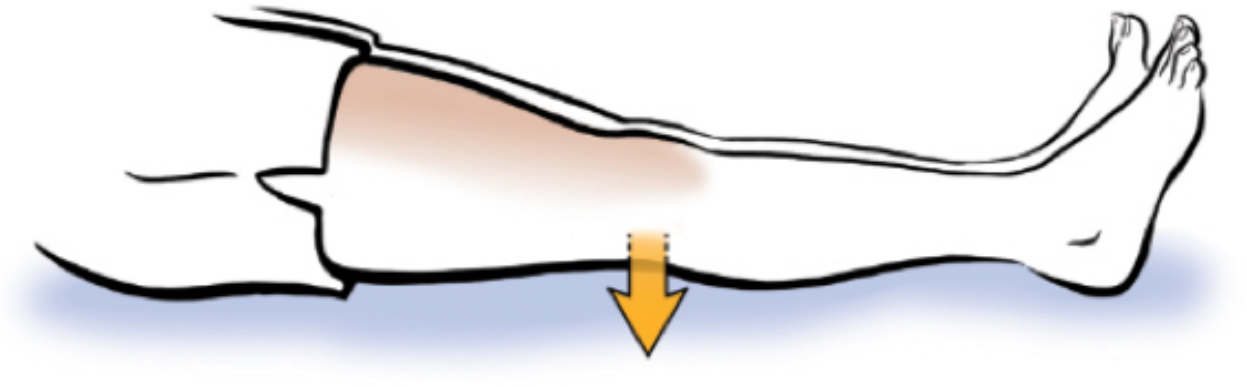
# Exercises for Before Surgery

These are some good exercises to do 2 to 3 times per day. After doing the exercises, put ice on your injured knee.

## Quad Contractions

**10 repetitions with a 5 second hold**

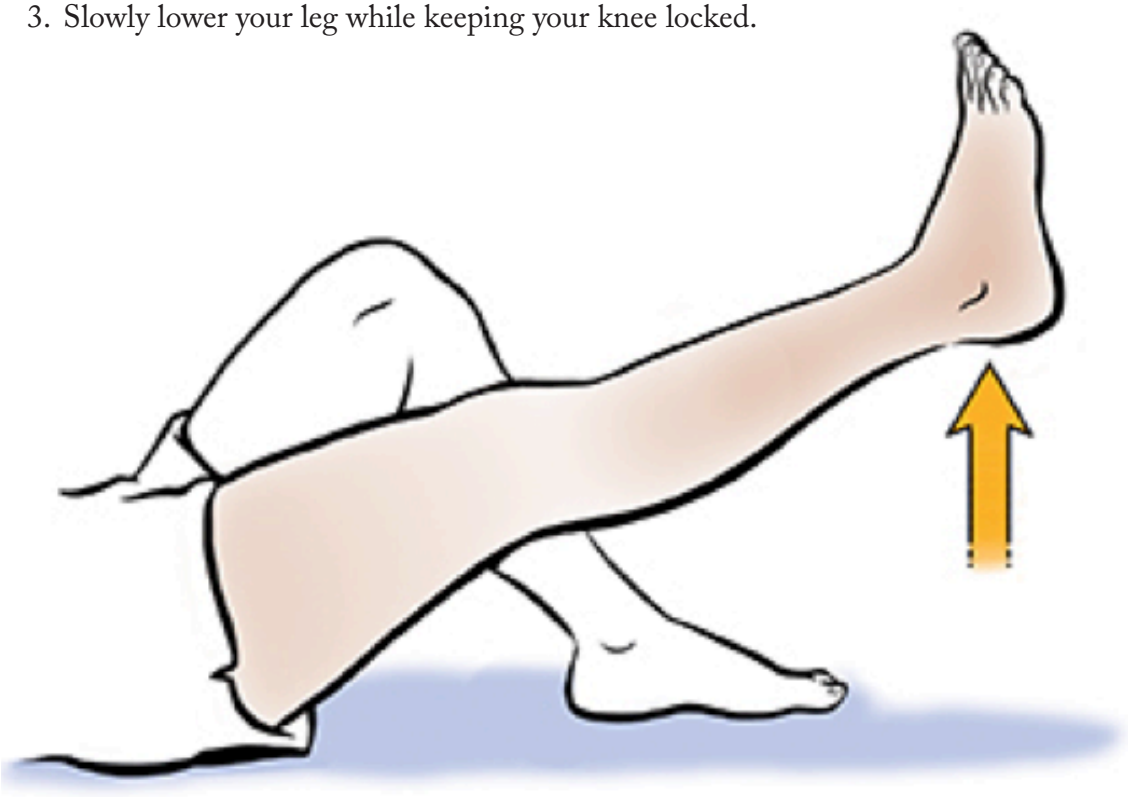
1. Sit or lie on your back with your leg straight.
2. Press the back of your knee down and hold for 5 seconds.
3. This will tighten the muscle on top of your thigh and move your knee as shown.



# Straight Leg Raises

**10 repetitions**

1. Lie on your back with your knee straight and your other knee bent as shown.
2. Keep your leg completely straight, and then raise it 12 inches from the floor.
3. Slowly lower your leg while keeping your knee locked.



# Heelslides

**10 repetitions with a 5 second hold in bent position**

1. Lie flat on your back.
2. Slide your heel toward your buttocks, bending your knee.
3. Hold the bent knee position for 5 seconds.
4. Slide your heel back to the starting position, straightening your leg.

# Before Your Surgery

One or two days before surgery, Sanford surgery schedulers will call you to confirm your surgery date and time. You will get information about restrictions for eating, drinking, and medications. The schedulers will get answers for any other questions you may have.

# Day of Surgery

When you wake up from surgery, a nurse will help manage your pain. You may not be able to move your leg right away after surgery. Your knee will be in a brace that will be locked straight. You will need crutches to move around. You will go home a few hours after you wake up from surgery. You will need someone to drive you home and stay with you for the next 24 hours after surgery.

# After Surgery

Within the 2 to 4 days after surgery, you will have an appointment at Sanford Sports Physical Therapy to begin your exercise program. Your physical therapist (PT) or certified athletic trainer (ATC) will work with you to help control your pain and swelling. This team will help you progress your exercise program based on your surgery. You should take your pain medication before your physical therapy sessions or performing any home exercises. Only take pain medicine as you were prescribed.

## Caring for Your Incision

You will get instructions about incision care before you are discharged from the hospital. Yours will be similar to this:

- Keep your dressing dry.
- Showers are allowed after your first visit with your PT or ATC. Talk with them about shower safety.
- Put plastic wrap or clean garbage bag over the brace when showering to keep it dry.
- Do not soak the knee or take baths until you are seen in the clinic.

If your dressing has some drainage on it, your physical therapist or athletic trainer may change the dressing before your first follow-up appointment with your doctor.

## Swelling Control

You will have swelling after surgery. You can reduce swelling by:

- Using ice or your cooling unit (Polar Care machine) frequently, especially during the first week after surgery.
  - Ice your knee for 30 to 45 minutes at a time with your cooling unit, or as directed on your post-operative (after surgery) instruction sheet.
  - Do not put ice directly on skin when your dressing is off.
  - Put ice/cold on top of compression sleeve when your dressing is gone.
- Elevate your knee.
  - Keep the knee straight with a pillow under your foot.
  - Elevate your knee above your heart.

# When to Call Your Physician

Contact your surgeon if:

- Your lower leg or toes feel numb, tingly, cool to the touch, or are pale
- You have a fever over 101 degrees Fahrenheit (38.3 degrees Celsius)
- Your incision:
  - Has increased redness
  - Is hot to touch
  - Is more painful than it has been
  - Oozes a new drainage or smells bad
- You have bleeding enough to come through your bandage
- Your pain medicine is not managing your pain
- You have side effects from your medicine such as an upset stomach, throwing up, redness, rash, or itching
- You have pain or swelling in the calf of either leg
- The edges of your incision come apart
- You have any questions or concerns about your health

# Rehabilitation Overview

Post-operative (after surgery) rehabilitation is needed for you to move and return to normal activity after an ACL reconstruction. The process for returning to physical and athletic activities includes:

- Time for the graft to heal
- Your ability to meet the goals for your rehab plan
- A gradual return to sport movements and activities
- Psychological readiness to return to sport

## Post-operative Bracing

When you wake up from surgery, your knee will be in a brace to keep it straight. For the first week after surgery, the brace will keep your leg straight while walking and sleeping. Your Physical Therapist will decide when it is okay for you to unlock your brace for walking and exercise.

The Physical Therapist will make the decision when you are able to:

- Do a straight leg raise
- Bend your knee
- Demonstrate control
- Balance with standing

If you had other repairs done, your post-surgery exercise and bracing plans may change.

## Driving

- You **cannot** drive while taking narcotic pain medication (Examples of this are, but not limited to, Percocet, Hydrocodone, Codeine.).
- You **may not** drive until your brace is unlocked.
- Talk with your doctor when you are able to return to driving.

## Returning to Work

The plan for returning to work will be different for each person. If you have a desk job, you will want to be off work for at least 7 to 10 days. If you do not have a desk job, your return to work will depend on the amount of swelling you have and the movements you do in your job that could cause harm to the knee. Talk with your doctor to make a plan for returning to work.

A rehab specialist will make your plan based on your goals, needs, and abilities along with any special instructions from your doctor.

## Recovery

The recovery of strength, balance, and movement may take 9 months or longer. Recovery takes hard work, rest, and good nutrition.

Your speed of recovery will depend on many things:

- Following your home program
- Motivation level
- Age
- Physical activity level before surgery

Following your rehab program will be the best way to help you return to an active life. You should follow your rehab specialist's instructions. If you do more stretching or strengthening exercises than your therapist taught, you may hurt yourself and slow your recovery.

# Nutrition for Injury Rehabilitation

After an injury, proper nutrition can help you get more out of physical therapy and improve recovery. Good nutrition can help to control inflammation (swelling), maintain muscle mass, and improve strength.

## Energy Needs

During rehabilitation, it is common to wonder what you should be eating to help with your recovery and avoid muscle loss or weight gain.

An injury may cause you to have a decrease in your physical activity. Your energy and macronutrient (carbohydrates, protein, and fat) needs are based on you, the duration and intensity of your daily activity, and the type of injury.

- Immobilization and decreased activity after an injury can cause anabolic resistance (more difficult to gain muscle) and muscle loss.
- Using crutches can raise energy usage 2 to 3 times higher than normal walking.
- Recovering from a surgery may call for more calories for healing.
- Eating too few calories and protein can slow your recovery.

Working with a dietitian can help you create a plan tailored to your recovery needs.

## Protein

An injury can cause muscle loss due to immobilization and decreased physical activity. Protein helps in building and repairing muscle. Higher protein requirements promote muscle recovery and prevent muscle losses during this time.

Aim to eat between 0.7 to 1 grams of protein per pound of body weight (1.6 to 2.3 grams/kg). You currently weigh _____ pounds, try to eat _____ to _____ grams of protein per day

Spread protein intake out throughout the day. A good goal is to have protein at each meal (15 to 30 grams every 3 to 4 hours), snack, post-workout, and each physical therapy session.

## Good Sources of Protein for Recovery

### Dairy

- 1 scoop whey protein: 20 to 25 g
- 1 cup cottage cheese: 22 g
- 5.3 oz. container Greek yogurt: 14 g
- 1 cup 1% milk: 8 g

### Plant-Based Foods

- 1 cup canned chickpeas: 12 g
- 1 cup cooked lentils: 17 g
- 3 oz. tofu: 9 g
- 1 cup shelled edamame: 18.5 g
- 1 cup cooked quinoa: 8 g

### Fish

- 3 oz. canned tuna: 17 g
- 3 oz. cooked salmon: 21 g
- 3 oz. cooked tilapia: 21 g

### Meat (Cooked)

- 3 oz. pork chop: 23 g
- 3 oz. chicken breast: 25 g
- 3 oz. steak: 23 g
- 3 oz. ground beef (90%): 21 g
- 3 oz. deli roast beef: 13 g
- 3 oz. deli turkey breast: 14 g
- 1 oz. beef jerky: 10 to 13 g
- 1 whole large egg: 7 g

## Important Nutrients for Recovery and Wound Healing After Surgery

**Vitamins A and C** - helps with wound healing, tissue repair, and immune function. Vitamin C-rich foods include citrus fruit, strawberries, pineapple, red bell peppers, and broccoli. Foods rich in vitamin A include sweet potatoes, tomatoes, carrots, papaya, and other orange or red fruits and vegetables.

**Antioxidant and anti-inflammatory compounds -** these can be found in berries, such as blueberries, blackberries, and tart cherries may help promote proper recovery.

**Zinc** - helps with wound healing, building muscle protein, and immune function. Good choices of foods for getting enough zinc include: beef, almonds, seeds (such as sunflower, flax, or pumpkin), and seafood.

**Healthy fats** – Foods that are high in healthy fats can help decrease inflammation. Include more omega-3 rich fish (salmon, sardines, herring), as well as healthy fats found in avocados, nuts and seeds, and olive oil into your daily diet.

## Things That Can Interfere with Healing

During your post-injury healing and rehabilitation period, avoid:

- Fried or high-fat foods like pizza, fried chicken, and French fries.
- Added sugars and concentrated sweets such as soda, candy, and ice cream.
- Alcohol - it inhibits muscle protein building and it increases muscle loss.
- Getting less than 8-10 hours of sleep each night.

The right nutrition helps to increase your post-injury recovery to get you back into the game sooner and healthier!

To find out more about your unique nutrition needs during recovery from an injury, ask your physical therapist about meeting with a sports dietitian.

# ACL Rehabilitation Timeline

The following summary will take you through the expected timeline of rehabilitation and goals to meet for you to return to your sport as quickly and safely as possible following ACL surgery. Timeframes may vary if you had other procedures at the time of surgery. Work with your physical therapist (PT) and certified athletic trainer (ATC) to meet the goals for each phase and to help you progress to a full recovery.

## Rehabilitation Timeline/Goals

## Injury Event

- ATC and doctor appointment

## Pre-operative Rehabilitation

This may happen 2 to 4 weeks before surgery.

- Physical therapy and/or ATC supervised treatment
- Goals to meet by the end of phase:
  - Full knee range of motion
  - Small amount of swelling or no swelling
  - Lessened or no pain
  - Normal gait mechanics (walking)

## Surgery

- You will have your ACL reconstruction surgery.
- See the information at the beginning of this book for information about your surgery like caring for your incision, driving after surgery, and recovery.

## Post-operative Rehabilitation

Your first Physical Therapy appointment should occur within 1 to 4 days after surgery. The timeframe of total recovery from this surgery may take 9 months or longer, depending on your goals and level of progress.

## **Phase 1:** Early Post-operative Phase

This phase starts immediately after surgery and continues up to 6 weeks.

- Compliance with your home exercises the first couple of weeks after surgery will dictate how easy or hard this phase will be to regain and maintain full knee range of motion.
- Supervised rehab may be 1 to 3 times per week depending on your symptoms and/or progress.
- During this phase, you will work on the normalization (getting back to your normal) of range of motion, swelling, gait (walking), and muscle activation.
- Goals to meet and complete by the end of phase 1:
  - Full knee extension equal to opposite side, flexion within 10 degrees
  - Proper quadriceps and gluteal activation
  - Normal gait pattern

## **Phase 2:** Intermediate Post-operative

This phase takes place during weeks 7 to 16 after your surgery. Supervised rehabilitation may be 1 to 2 times per week in the clinic. This will depend on your progress and your compliance with a home program. During this phase, you will:

- Continue to progress with strengthening exercises gradually increasing your level of intensity and difficulty.
- Learn movement strategies (proper hip and shock absorption strategies) that decrease strain to your ACL.
- Complete the Level 1 assessment. This test will evaluate your strength, range of motion, balance, and movement. The results from the test help identify your new goals for the next stage of rehab.
- Goals to meet and complete by the end of phase 2:
  - Quad, hamstring, and hip strength should be 70 to 80% of the non-surgical leg by week 16
  - Make a plan with your surgeon and rehab team for how you will continue to work on strength and athleticism when you are done with formal therapy. One good option is the SHARP program.

## **Phase 3:** Advanced Movement and Impact Phase

This phase happens between 4 to 9 months after your surgery. In this phase, you may progress to SHARP, a supervised transitional rehab program, which can be tailored to you and where you live. During this phase, you will:

- Perform progressive strengthening and complex movement re-training
  - Landing
  - Jumping
  - Cutting
  - Deceleration (slowing down)
  - Progress from double leg activities to single leg activities
- Practice sport specific drills without opposition in a controlled speed environment.
- Complete the Level 2 assessment which will determine your level of readiness to return to your sport and the specific position drills for a team environment. This assessment will look for risk factors for ACL injury to improve movement patterns. **No** assessment can assure you will not re-injure your ACL. This is the best assessment to find risk factors for re-injury that you can change before returning to sports.
- Have a re-check appointment with your doctor to review the results of the Level 2 test.
- Goals to meet and complete by end of phase:
  - Start a running program if you have not started a program yet.
  - Complete and pass Level 2 assessment

## **Phase 4:** Return to Play

The decision on when to return to play is a complex one and should involve everyone on your care team. Your care team will provide you with guidelines for returning to sports which are meant to provide you the safest return possible.

This **must be approved** by your doctor and rehab team. This is the final phase of your rehabilitation. This is a gradual transition back to playing your sport and activities. You **must** follow the return to play timeline to get your body and knee into playing shape. During all drills and when fatigued (tired), you **must** use good lower extremity biomechanics (correct form and movement). Continue to work with your athletic trainer or your coaches for a smooth and safe return to play. Timelines for each part of the return to play phase will depend on your sport, the position you play, and your knee function. The normal guidelines are 1 to 2 weeks for each phase. This phase may also include a final assessment around the 8 or 9 month mark.

The phases of return to play are:

- Speed, power, and agility development
- Open drills and tasks
  - Reactionary training
  - Training in a fatigued state using good biomechanical techniques
- 1 on 1 drills (no contact) – sport specific drills and activities where you practice how to react to an opponent
- 1 on 1 drills – full speed with game necessary contact
- Team scrimmage (no contact) – you will wear a different colored jersey to indicate your contact restrictions during team scrimmage (no contact)
- Team scrimmage – full scrimmaging
- Restricted Play – progressing time and situational play as appropriate
- **Full return to unrestricted play**
- Goals to meet and complete by the end of phase 4:
  - Complete timeline
  - Your doctor and/or rehab team approval to return to unrestricted play

# Sanford Health Athletic Readiness Program (SHARP)

SHARP is a unique physical rehabilitation program for patients who have had an injury or surgery. The program was made to support therapy and help an athlete with a supervised strength and movement plan. This program happens in phase 3 of the rehabilitation timeline. Your care team works with you to make a unique program to help you get back to playing your sport. This program is self-pay, but it is a high quality, flexible option as athletes feel more comfortable progressing with supervision and instruction.

Another benefit of the SHARP program is the ongoing communication between the physician and the rehab team. This is critical in the return to play discussions.

More information about Sanford Sports Performance can be found at www.sanfordsports.com.

SANFORD SPORTS PERFORMANCE

# NOTES

SANFORD®

ORTHOPEDICS
SPORTS MEDICINE

019051-00265 PE 12/23