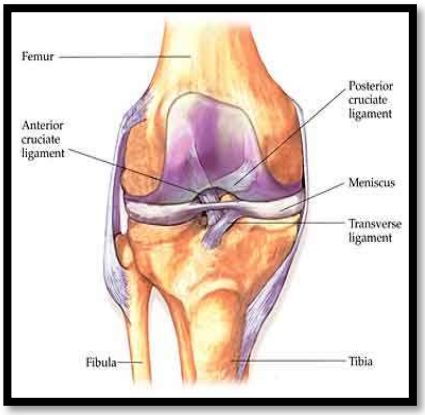
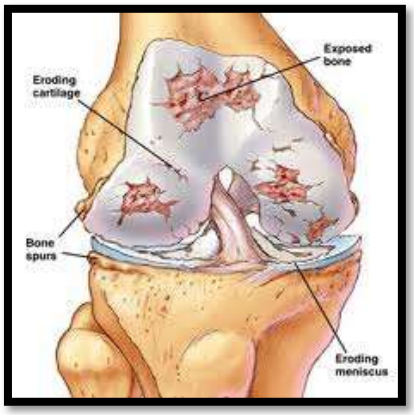
Total Knee Arthroplasty (TKA) Rehabilitation Protocol

Anatomy and Biomechanics

The knee is a simple hinge joint at the connection point between the femur and tibia bones. The smooth articular cartilage surface of the femur sits on top of the cushioning discs of fibrocartilage on the tibia known as the medial and lateral meniscus. These smooth surfaces that make up the knee joint will naturally wear down over time creating a rougher surface with which to weight bear on. Without smooth healthy cartilage the knee also has a hard time producing the natural joint fluid that lubricates the knee during movement. Collectively, these degenerative processes that happen over time lead to the condition known as osteoarthritis. This process happens naturally over time to everyone, but can be more severe or develop quicker in some people.





As degenerative changes in the knee advance the joint becomes more painful and less mobile. Osteoarthritis typically results in stiffness in the joint and pain during weight bearing activity. This is especially true right after a period of immobility (ie when getting up after sitting for a long time). The pain in the joint may subside after moving around, but become worse again when standing or walking for long periods of time. As the condition of the joint deteriorates it will become more difficult to bear weight on it and eventually the joint may lose some of its range of motion.

Treatment Options

Based on the nature and severity of the osteoarthritis in your knee your physician will work with you to determine what the best course of treatment will be. When degenerative changes are not severe the associated pain and dysfunction may successfully be treated with rest, anti-inflammatory measures, activity modification and physical therapy. Injections of cortisone or joint lubricants may provide temporary improvement in pain and function. After a thorough evaluation your physician and their staff will recommend the most appropriate course of action to take.

Physical therapy is often recommended for treatment of pain and dysfunction associated with osteoarthritis. The physical therapist will evaluate your mobility, flexibility and strength with the purpose of determining any underlying deficits that contribute to increased stress on the painful joint. You will be counseled on which activities you can safely continue and which should be avoided. The physical therapist will teach you exercises that will help to reduce joint stress. In most cases this will include strengthening and stretching the muscles around the hip and knee, as well as strengthening your core.

If joint degeneration is severe and conservative measures are unsuccessful in restoring function your physician may recommend a total knee replacement procedure.

Surgery

Total Knee Arthroplasty (Replacement) is a complex procedure that involves the removal and

replacement of both the tibial and femoral weight bearing surfaces of the knee. First the ends of both bones are removed. Then metal implants are inserted into the ends of the femur and tibia. The metal implant that is used on the tibial side of the joint has a polyethylene (plastic) piece attached to it that serves as the weight bearing surface of the new joint. Your surgeon may elect to use bone cement to help hold these implants in place. During the knee replacement procedure the undersurface of the knee cap is often removed as well, and is replaced with a polyethylene cap. Some of the structural ligaments of the knee may also be adjusted during the procedure so as to assure that the knee is stable and well aligned after surgery.

Each patient will be required to go through a pre-operative educational class which will review in detail the typical patient experience in the early phases of recovery. Some physicians require an appointment with your dentist to ensure there are no active dental problems. Issues such as dental infection may affect the results of your surgery. Many patients will also be required to see their primary care physician prior to surgery.

Total Knee Arthroplasty is not currently an outpatient day surgery procedure. You will typically spend 1-2 days in the hospital to recover. You will be out of bed the same day as your surgery. You will be working with physical and occupational therapy on a daily basis in the hospital. Most patients are able to go directly home after discharge. Some more complex cases may require a short stay in a rehab facility following their hospital stay.

Home Visits

You will likely receive home care visits from a registered nurse and a physical therapist after being discharged home. The nurse will help monitor your medical status and the physical therapist will help you work to restore mobility, strength and tolerance for activity. Your home care physical therapist will work with your surgeon and their staff to determine when you are ready to attend outpatient physical therapy. This will typically be around 3 weeks from your operation.

Surgical Incision/Dressing

You will have a dressing placed on your knee after surgery which will remain in place for 1 week. If you have staples closing your incision they will likely be scheduled to be removed, and replaced with steri-strips, around 10-14 days after the operation. Allow the steri-strips to fall off on their own or to be removed at your next doctor's office visit. If your surgeon used glue to close the wound do not remove it and it will gradually fall off approximately 1 month after surgery.

Showering

You may shower with the post-op dressing immediately. After the dressing is removed you may shower as long as the incision is not draining. If the incision is draining try to keep it from getting wet during showering by using a water-tight dressing. It is best to use a shower bench if possible for safety.

Medication

Your surgeon will prescribe pain medicine for you after the operation. Please call the doctor's office if you have any questions regarding medication. As time goes on you will require less and less pain medication. Your goal should be to switch from a narcotic medication to an over the counter pain medication as soon as you are able.

Driving
Your surgeon will tell you when you are ready to return to driving. Commonly, you are not permitted to drive for 6 weeks if you had your right knee replaced, and 4 weeks if you had your left knee replaced. You cannot drive while taking narcotics.

Elevation
Elevating your lower extremity periodically throughout the day can help reduce swelling. It is recommended that you elevate your operative leg 3 to 4 times a day for 30 minutes. To elevate properly make sure to lie flat on your back and have your operative leg in a fully straightened position with your foot above the level of your heart. You may use ice and elevate your leg at the same time.

Ice
You must use ice on your knee after the operation for management of pain and swelling. Ice should be used consistently throughout the day while in the hospital. Once home, you may taper down to applying ice 3-5 times a day for 10 to no more than 20 minutes at a time. Typically the best time for this is after exercise. Always maintain one layer between ice and the skin. Putting a pillowcase over your ice pack works well for this. The home care physical therapist can help you customize a plan on how and when to best apply ice to your knee.

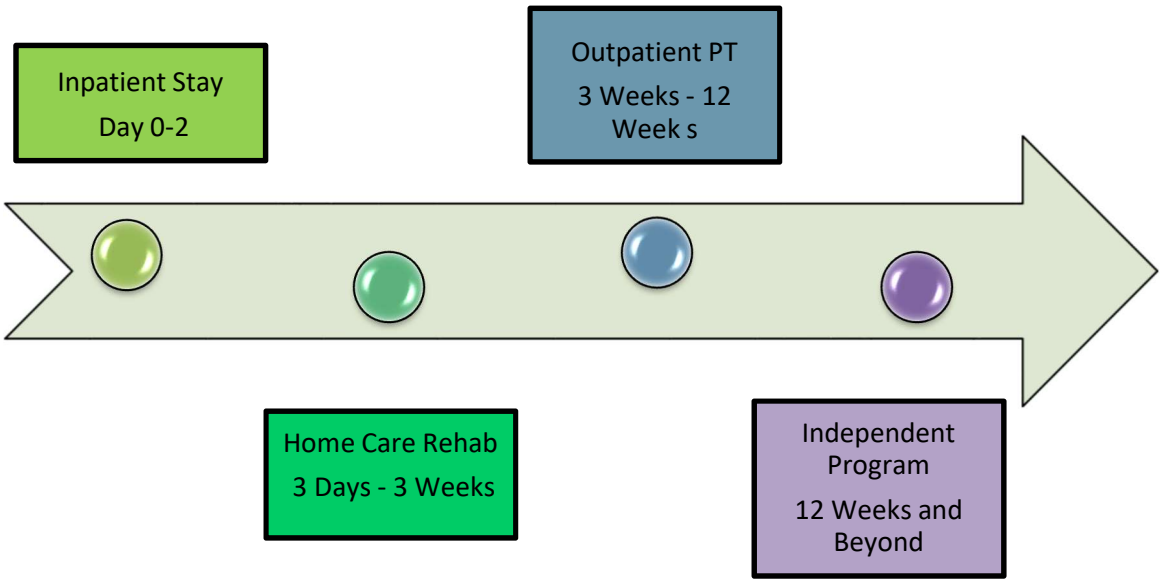
Post-Operative Office Visits
Your first post-operative visit will be as early as 10 -14 days after the operation. At this visit you will meet with the surgeon or the physician assistant who will examine your knee's range of motion and strength, the surgical incision. If staples are present they will be removed and replaced with steri-strips. Should you have any cause for concern prior to your first office visit you should call your surgeon's office for advice. Your next visit will be around 6 weeks after the operation. At this visit you may have an X-ray taken to make sure that the knee replacement components are aligned well, and you will discuss when it will be appropriate to make an appointment to begin outpatient physical therapy. Additional follow up visits to the doctor's office will be based on your surgeon's discretion.

Weight Bearing
After surgery you are allowed to put as much weight on your operated leg as you can tolerate (unless otherwise indicated by your surgeon). For the first several weeks after surgery you will require the use of a walker or crutches. As your tolerance for weight bearing improves your physical therapist will transition you to walking with a cane. Eventually, when your gait is normal you will be able to walk without an assistive device. Many patients are able to walk without an assistive device by six weeks after the operation. Remember, proper gait pattern *must* be achieved in order to discontinue use of assistive devices.

Recovery/Time off Work
Recovering from Total Knee Arthroplasty surgery is not easy. It is very important that to realize

that the recovery process is difficult and time consuming. You must be an active participant during this process, performing daily exercises to ensure there is proper return of range of motion and strength. There is a large amount of variability in the time it takes to fully recover from this procedure. It is usually estimated that it will take at least 4-6 months for the patient to feel as though he or she has completely returned to a pre-injury level of activity. Some cases may take as long as 9-12 months to make a full recovery. People with desk jobs should plan to take at least 4 weeks off from work and should have an extended absence plan in place should complications arise. People with more physical jobs that require excessive weight bearing and manual labor will likely be out of work for at least 3-6 months. **Recovery is different in each case**. Your individual time table for return to activities and work will be discussed by your surgeon during post-operative office visits.

Typical Rehabilitation Continuum Time Frames Following TKA:



Outpatient Discharge Criteria

You are ready for discharge from outpatient PT typically when you reach 70-80% functional level compared to before surgery. This can vary greatly based on your prior level of function. Some criteria may include:

- Walking normally without any assistive device
- Negotiate stairs reciprocally and safely
- Getting in/out of a car without difficulty
- Donning/doffing shoes and socks without difficulty

Being discharged from PT does NOT mean that you are exempt from you home exercise program. For optimal outcome after surgery, it is important to continue with your specific program designed by your PT.

Rehabilitation

****The following is an outlined progression for rehab. Time tables are approximate and advancement from phase to phase, as well as specific exercises performed, should be based on each individual patient's case and sound clinical judgment by the rehab professional. ****

Phase 1: Phase (Day 0- Hospital Discharge)

Goals

- Control pain and swelling
- Protect healing tissue
- Begin to restore range of motion (ROM)
    - Knee flexion at least 90 degrees
    - Knee extension less than or equal to 0 degrees
- Establish lower extremity muscle activation
- Restore independent functional mobility

Precautions

- WBAT with crutches or walker unless otherwise ordered
- Screen for sensory/motor deficits
- Screen for DVT, symptomatic orthostatic hypotension, symptomatic low hematocrit

Recommended Exercises

Range of Motion

- Passive knee flexion and extension
- Heel slides
- Active assisted knee flexion/extension in sitting
- Ankle pumps

Strength

- Quad sets
- Glut sets
- Hamstring sets
- Straight leg raises (SLR): emphasizing no lag
- Hip abduction/adduction
- Long arc quads (LAQ)
- Seated hip flexion

Functional Mobility

- Bed mobility
- Transfer training
- Gait training on level surfaces
- Stair training
- Activities of daily living with adaptive equipment (as needed)

Positioning (when in bed)

- Use a towel roll under ankle to promote knee extension
- Use a trochanter roll to maintain hip in neutral rotation and promote knee extension
- Never place anything under the operated knee

Guidelines

Perform 10 repetitions of all exercises 3-5 times a day. Use ice after exercising for 10-20 minutes.

Inpatient Plan of Care

Day of Surgery

- Out of bed to a chair
- PT Evaluation

Post Op Day 1

- PT and OT Evaluations
- Therapeutic Exercise including ROM, Strengthening, and Functional Mobility as appropriate
- ADL Training as appropriate

Post Op Day 2-Discharge

- Progression of Therapeutic Exercise and Functional Mobility
- Continued ADL Training

Phase 2: (Hospital Discharge-6 Weeks)

Goals

- Continue to improve ROM with a goal of 0- 110 degrees
- Begin to restore muscle strength throughout the operated leg, with special focus on the quadriceps
- Initiate proprioceptive training
- Initiate endurance training
- Normalize all functional mobility
- Wean all assistive devices, emphasizing normal gait pattern

Precautions

- WBAT with crutches or walker, progressing to cane, then weaning devices as appropriate
- Monitor for proper wound healing
- Monitor for signs of infection
- Monitor for increased swelling

Recommended Exercises

Range of Motion

- Continue with all phase 1 ROM exercises
- Heel slide with towel
- Prone knee flexion
- Heel prop (towel under ankle) and/or prone knee hang to promote full extension
- Initiate stationary biking, starting with back and forth motion progressing to full revolutions as able

Joint Mobilizations and Stretching

- Initiate patellofemoral and tibio-femoral joint mobilizations as indicated
- Initiate hamstring, gastroc/soleus, and quadriceps stretching

Strengthening

- Quad sets, glut sets, hamstring sets

- Use neuromuscular electrical stimulation (NMES) to quads if poor quadriceps recruitment is present
- SLR without lag, add resistance towards the end of this phase
- Hip abduction/ adduction/ extension against gravity, add resistance towards the end of this phase
- Progress to closed chain exercises including terminal knee extensions, mini-squats, step ups, and mini-lunges by the end of this phase

Proprioception
- Single leg stance

Functional Mobility
- Gait training with appropriate device emphasizing normal gait pattern
- Stair training with appropriate device

Guidelines
Perform 10-20 repetitions of all ROM, strengthening, and strengthening exercises 3x/day. Hold stretches for 30 seconds and perform 2-3 repetitions of each. Bike daily for 5-10 minutes if able.

Phase 3: (6-12 Weeks)

Goals
- Maximize knee ROM
- Restore normal LE strength, especially normal quadriceps function
- Return to baseline functional activities

Precautions
- Avoid high impact activities
- Avoid activities that require repeated pivoting/twisting

Recommended Exercises
Range of Motion and Flexibility
- Continue ROM exercises from phase 1 and 2
- Continue biking, adding mild to moderate resistance as tolerated

Joint Mobilizations
- Continue with phase 2 activities as indicated

Strengthening
- Continue with phase 2 exercises adding and increasing resistance as tolerated
- Add resistance machines as appropriate including leg press, hamstring curl, and 4-way hip machine
- Emphasize eccentric control of quadriceps with closed chain exercises

Proprioception
- Single leg stance
- Static balance on Bosu/wobble board/foam/etc
- Add gentle agility exercises (i.e. tandem walk, side stepping, karaoke, backwards walking)

Endurance
- Biking program
- Begin walking program

Guidelines
Perform ROM and stretching exercises once a day until normal ROM is achieved. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
Perform strengthening exercises 3-5 times a week. Do 2-3 sets of 15-20 Reps.
Bike daily for ROM at least 10 minutes if able.
Progress to biking/walking for at 20-30 minutes 3x/week for endurance.

Phase 4: (12 Weeks and Beyond)

Goals

- Continue to improve strength to maximize functional outcomes
- Return to appropriate recreational activities (i.e. golf, doubles tennis, cycling)

Precautions

- Avoid high impact, and contact sports
- Avoid repetitive heavy lifting

Recommended Exercises

ROM and Flexibility

- Continue daily ROM and stretching exercises

Strengthening

- Continue with all strengthening exercises increasing resistance and decreasing repetitions

Proprioception

- Continue with all phase 3 exercises, increasing difficulty as tolerated.

Endurance

- Continue with walking, biking, elliptical machine programs

Guidelines
Perform ROM and flexibility exercises daily.
Perform strengthening and proprioception exercises 3-5x/ week, performing 2-3 sets of 10-15 repetitions.
Continue endurance program 30-45 minutes 3x/ week.

Time	Precautions	Goals	Recommended Exercises
Phase 1: Day 1 – Hospital D/C	• WBAT with crutches or walker unless otherwise ordered by MD • Screen for DVT • Screen for sensory/ motor deficits	• Control pain and swelling • ROM: knee flexion to at least 90˚, knee extension 0˚ • Establish LE muscle activation • Restore independent functional mobility	<u>ROM</u> • P/AA/AROM knee flexion and extension • Heel slides • Ankle pumps <u>STRENGTH</u> • Quad/glut/hamstring sets • Hip Abd/Add • LAQ • Seated Hip Flexion • SLR (*NO* lag) <u>FUNCTIONAL MOBILITY</u> • Gait training with appropriate assistive device on level surfaces • Transfer training • Stair training <u>POSITIONING (when in bed)</u> • Towel roll under ankle to promote knee extension • Trochanter roll to maintain hip neutral rotation and promote knee extension • Never place anything under the operated knee
Phase 2: Hospital D/C – 6 weeks	• WBAT with crutches or walker, progressing to cane, then weaning all devices as appropriate • Monitor for proper wound healing • Monitor for signs of infections • Monitor for increased swelling	• ROM: 0 to at least 100˚ • Normalize all functional mobility • Wean all assistive devices • Begin to restore LE strength, especially quads • Initiate proprioceptive training • Initiate endurance training	<u>ROM</u> • Continue with all phase 1 exercises • Heel slide with towel • Prone knee flexion • Heel prop and/or prone knee hang to promote full extension • Initiate stationary biking <u>Joint Mobilizations and Stretching</u> • Initiate patellofemoral and tibio-femoral joint mobilizations as indicated • Initiate hamstring, gastroc/soleus, and quadriceps stretching <u>Strengthening</u> • Quad/glut/ham sets • Use NMES to quads if poor quad recruitment in noted • SLR without lag, adding resistance towards the end of this phase • Hip abduction/ adduction/ extension against gravity, adding resistance towards the end of this phase • Closed chain exercises (TKEs, mini-squats, step ups, mini-lunges) by the end of this phase <u>Proprioception</u> • Single leg stance <u>Functional Mobility</u> • Gait training with appropriate device emphasizing normal gait pattern • Stair training with appropriate device

Phase 3: 6-12 weeks	• Avoid high impact activities • Avoid activities that require repeated pivoting/ twisting	• Maximize knee ROM • Restore normal LE strength, especially normal quad function • Return to baseline functional activities	ROM • Continue phase 1 and 2 exercises Joint Mobilizations and Stretching • Continue with phase 2 activities as indicated Strengthening • Continue with phase 2 exercises, increasing resistance as tolerated • Add resistance machines as appropriate (leg press, hamstring curl, 4-way hip) Proprioception • Single leg stance • Static balance on Bosu/wobble board/foam/etc • Add gentle agility exercises (i.e. tandem walk, side stepping, karaoke, backwards walking Endurance • Biking program, adding mild to moderate resistance as tolerated • Begin walking program
Phase 4: 12 weeks and beyond	• Avoid high impact, and contact sports • Avoid repetitive heavy lifting	• Continue to improve strength to maximize functional outcomes • Work with PT and MD to create customized routine to allow return to appropriate sports/ recreational activities (i.e. golf, doubles tennis, cycling, hiking)	ROM • Continue daily ROM and stretching exercises Strengthening • Continue with all strengthening exercises increasing resistance and decreasing repetitions Proprioception • Continue with all phase 3 exercises, increasing difficulty as tolerated Endurance • Continue with walking, biking, elliptical machine programs Functional Progressions • Activity/sport-specific training exercises