Rehabilitation Protocol for Total Knee Arthroplasty (TKA)

This protocol is intended to guide clinicians through the post-operative course for total knee arthroplasty (TKA). This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary based on preference, additional procedures performed, and/or complications. If a clinician requires assistance in the progression of a patient, they should consult with the referring physician.

The interventions included within this protocol are not intended to be an inclusive list of exercises. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

If the patient develops a fever, intense calf pain, unresolving numbness/tingling, excessive drainage from the incision, uncontrolled pain or any other symptoms you are concerned about, contact the referring surgeon.

Post-operative Considerations

Patient Education & Engagement: Reinforce adherence to home exercise, proper technique, gradual progression, and continuity of care
Outcome Monitoring: Utilize standardized measures (Knee Society Score, WOMAC, Timed Up and Go)
Individualization: Adjust intensity, progression, and manual therapy techniques based on patient response, comorbidities, and surgeon directives
Long-Term Adherence: Encourage sustained exercise and activity beyond six months for maintained strength, function, and joint health

PHASE I: IMMEDIATE POST-OPERATIVE PHASE (0-7 DAYS AFTER SURGERY)

Rehabilitation Goals	• Maintain a quiet knee (minimal pain and inflammation) • Protect surgical site and promote wound healing • Monitor wound healing for signs of infection • Screen, monitor and prevent for DVT • Initiate activation of the quadriceps muscles • Begin gentle, safe, and assisted mobilization as soon as possible
Precautions	• Adhere to surgeon's weight-bearing instructions if restricted • Avoid forcing painful ROM or pushing through sharp pain • Protect the incision site (no submersion until cleared) • Avoid placing a pillow/towel roll directly under the knee • Avoid twisting/pivoting movements • Limit prolonged sitting, standing to prevent excessive swelling • Limit ambulation to 700 steps/day
Interventions	*Education* • Activity modification: avoid aggravating activities • Positioning: heel prop • Limit prolonged sitting, standing, walking *Functional mobility and training* • Bed mobility

	• Transfers
	• Gait training on level surfaces
	• Stair training
	• ADLs with adaptive equipment
	
	Pain and edema management
	• Cryotherapy (15-20 minutes every 2-3 hours)
	• Elevation (lower extremity above the level of the heart)
	• Compression (garments approved by surgeon)
	
	Manual therapy
	• Grade I-II patellar mobilizations
	
	Range of motion/Mobility
	• Seated AAROM knee flexion
	• Supine AAROM heel slides
	• Standing supported stair stretch
	• Supine heel propped knee extension with towel
	
	Strength/Stability
	• Augment exercise with NMES, consider home units distributed pre-operatively
	  • Frequency: 2500Hz, 75 bursts/sec
	  • Pulse Width: 400 microseconds
	  • Intensity to motor contraction
	  • 10 sec on/50 sec off
	• Isometric quad activation
	• SLR flexion
	• Gluteal sets

Criteria to Progress	• Manage pain with minimal swelling • Able to achieve near full extension and >70° knee flexion • Demonstrate quadriceps control (e.g. perform straight leg raise without lag) • Safe ambulation with an assistive device within home environment

PHASE II: EARLY POST-OPERATIVE PHASE (1-4 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Restore full knee extension early • Maintain patellar mobility • Increase knee flexion to >90°, as tolerated • Begin strength restoration with focus on quadriceps muscles • Begin functional mobility with reduced reliance on assistive devices • Minimize gait compensations
Precautions	• Avoid deep squats, pivoting, and impact activity • Monitor for increased pain or swelling • Adhere to surgeon-specific restrictions
Additional Interventions **Continue with Phase I interventions*	*Manual therapy* • Grade I-II tibiofemoral mobilizations for pain management • Grade III-IV patellar mobilizations • Light soft tissue mobilization to quadriceps and hamstring muscles *Range of motion/Mobility* • AAROM supine wall slides • Supine heel propped knee extension with towel • Supine heel propped knee extension with weight • Upright or recumbent stationary bicycle for ROM

	Stretching • Supine gastrocnemius stretch with strap • Seated hamstring stretch • Low load prolonged knee flexion stretch *Strength/Stability* • Sitting quad activation at varying angles • Supine short arc quad • Sit to stand • Standing mini squat with counter support • Supine bridging • Sidelying abduction • Sidelying SLR adduction • Prone SLR extension • Sidelying clamshells • Standing hamstring curls *Endurance training* • Walking: progress to community ambulation • Bicycle: light resistance or ROM only *Balance/Proprioception* • Weight shifting with upper extremity support • Side stepping at counter • Double leg stance on level surfaces
Criteria to Progress	• Minimal controlled edema with all activity and exercise • ROM: Near full extension and >90° knee flexion • Good quadriceps endurance (e.g., ten straight leg raises without lag) • Safe ambulation with least restrictive assistive device in the community • Control of post-operative pain (0-3/10 with ADLs)

PHASE III: INTERMEDIATE POST-OPERATIVE PHASE (4-8 WEEKS AFTER SURGERY)

Rehabilitation Goals	• Increase knee flexion (>110° if possible) while maintaining full extension • Improve quadriceps, hip, and core strength • Normalize gait pattern; reduce reliance on assistive devices • Begin balance, proprioception, and more advanced functional tasks
Precautions	• Avoid high-impact activities • Progress load gradually, monitoring for swelling/pain • Maintain proper knee alignment during closed-chain exercises • Maintain a quiet knee
Additional Interventions **Continue with Phase II interventions*	*Functional training* • Transfers with least restrictive assistive device • Stair training with least restrictive assistive device • Gait training on flat surface with least restrictive assistive device • Carrying light loads *Manual therapy* • Progress tibiofemoral mobilizations (grade III-IV), if PCL is not spared • Soft tissue mobilization to address tight IT band, quads, hamstrings • Scar mobilization if well-healed *Range of motion/Mobility* • Prone knee hangs • Retro-walking to promote active terminal extension

	Stretching
	• Gastrocnemius stretch
	• Soleus stretch
	• Standing hip flexor stretch
	• Standing hamstring stretch
	
	Strength/Stability
	• Progression of quad strengthening with use of NMES, as indicated
	• Long arc quad (LAQ)
	• Standing hip abduction with resistance band
	• Standing hip extension with resistance band
	• Standing hip flexion with resistance band
	• Wall sits with resistance band to engage hip abductors
	• Functional LE strengthening with use of NMES, as indicated
	  • Forward step ups
	  • Forward step downs
	  • Lateral step downs
	  • Partial squat exercise, progressing to squats
	  • Mini lunges, progressing to lunges
	• Lumbopelvic strengthening bridge & unilateral bridge, sidelying hip external rotation, clamshell, bridges on physioball, bridge on physioball with roll-in, bridge on physioball alternating, hip hike
	• Gym equipment: leg press machine
	
	Balance/Proprioception
	• Static Balance
	  • Single leg stance on level surface
	• Proprioceptive training on dynamic surfaces
	  • Double leg stance on balance board/rocker board
	• Lateral step-overs
	
	Endurance training
	• Progress walking distance on treadmill or flat terrain
	• Elliptical machine

Criteria to Progress	• Near full or functional ROM (≥110° flexion, full extension) • Normalized gait without assistive device • Controlled performance of 6" step ups/downs • Exercise/activity without increased pain or swelling

PHASE IV: ADVANCED POST-OPERATIVE PHASE (8-12 WEEKS AFTER INJURY)

Rehabilitation Goals	• Achieve near-normal strength (≥80% of non-operative limb) • Attain full or near-full ROM suitable for daily tasks (>120°) • Promote proper movement patterns
Precautions	• Avoid uncontrolled pivoting/cutting movements • Slow progression of load and complexity without pain or swelling • Continue to avoid high impact activities
Additional Interventions **Continue with Phase I-III Interventions*	*Functional training* • Gait training on uneven surfaces, inclines, and declines • Carrying moderate loads *Manual therapy* • Progress tibiofemoral mobilizations (grade III-IV as tolerated) if ROM plateaus *Stretching*

	• Prone quad stretch
	• Kneeling hip flexor stretch
	• Seated figure-four stretch
	
	Strength/Stability
	• Increase load and ROM in prior strengthening exercises: squats, lunges, leg press
	• Progress weight bearing hip strengthening
	  • Side steps with resistance band
	  • Monster walks
	• Progress exercises to include multi-planar movements
	• Gym equipment: hamstring curl machine, leg extension machine
	
	Balance/proprioception
	• Static Balance
	  • Single leg stance on level surface
	  • Single leg stance on uneven surface
	  • Single leg stance with perturbation
	• Proprioceptive training on dynamic surfaces
	  • Double leg stance on balance board/rocker board
	• Agility training
	  • Tandem walking
	  • Walking on uneven surfaces
	
	Endurance training
	• Stationary bicycle: moderate resistance
	• Begin aquatic program *if incision is complete healed and cleared by surgical team
	• Progress treadmill walking: incline

Criteria to Progress	• ≥80% strength of non-operative limb • Full or near-full ROM without limiting function (confirming prosthesis limitation) • Controlled performance of 8" step-ups/downs • Progression of strengthening program without pain or swelling • Sufficient balance and proprioception for community-level ambulation without fear or instability • Clearance from MD for progression to low-impact recreational activities

PHASE V: LATE POST-OPERATIVE (3-6 MONTHS AFTER INJURY)

Rehabilitation Goals	• Restore full strength and functional capacity • Gradually return to low-impact recreational activities (golf, tennis, hiking) per clearance of physician • Improve overall cardiovascular fitness, endurance, and neuromuscular control
Precautions	• Perform controlled single leg squat, prior to initiation of impact activity • Avoid high-impact sports, unless cleared by MD/PT • Introduce sport-specific drills slowly; ensure stable, pain-free mechanics • Maintain quiet knee
Additional Intervention **Continue with Phase I-IV interventions*	*Strength/Stability* • Increase load in prior strengthening exercises • Progress exercises to include more complex multi-joint movements in multiple planes *Plyometrics* • Once able to perform 3 sets of 15 of bilateral standing heel-raises with equal weight bearing progress to bilateral rebounding heel raises • Once able to perform 3 sets of 15 unilateral heel raises progress to rebounding unilateral heel raises

	• Once able to demonstrate good performance/tolerance with rebounding heel raises then initiate bilateral hopping sequence (in place, forward/back, lateral) and then progress to unilateral hopping sequence able *Endurance training* • Stationary bicycle: high resistance • Swimming • Begin Return to Running program ****High impact activities such as plyometrics and running are generally discouraged following total joint arthroplasty, but consideration must be given to patients' goals and whether they have prior experience performing the high impact activity. Due to limited evidence on how high impact activities affect the integrity of artificial joint replacement, patients are advised to participate in low/moderate impact exercise/activities. Consult surgeon prior to initiating plyometric activities and return to run program.**

Criteria to Progress	• 95% LSI of quad, hamstring, and gluteus medius strength with HHD
	• Quad/HS/glut limb symmetry index ≥95%; HHD mean or isokinetic testing @ 60d/s
	• Participation in desired low-impact activities without pain or swelling
	• Participation in intermediate-impact activities after 6 months with prior experience in activity
	  • Proper mechanics in low and intermediate-impact activities
	  • Clearance from MD for further progression

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Contact	Please email MGHSportsPhysicalTherapy@partners.org with questions specific to this protocol	

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