



Rehab Practice Guidelines for: Unilateral Total Knee Arthroplasty (TKA)

- Primary surgery: Tricompartmental, TKA-any approach
- Expected # of visits: Dependent on when patient begins physical therapy, can range from 16-28 visits
- Recommended progression of strengthening exercises²
- Strengthen at 70% of 1 Repetition Maximum or 100% of 8 Repetition Maximum (*updated: 3/2/15)
 - Once able to perform 3 sets of 8 reps with minimal fatigue increase to 3 sets of 10 reps.
 - Once able to perform 3 sets of 10 reps with minimal fatigue re-assess 8RM and add resistance; accordingly, start back at 3 sets of 8 reps with added resistance.

Considerations

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Patient Education¹¹	<ul style="list-style-type: none"> ▪ Encourage loading of surgical limb and to be active ▪ Instruction in HEP and activity ▪ Prior to discharge review and practice proper kneeling techniques
Home Exercise Program¹⁰	<ul style="list-style-type: none"> ▪ First month post-op exercises 2x daily, afterwards 1x daily, at discharge 3-5x/week based on recovery. ▪ Home activity: <ul style="list-style-type: none"> ○ Phase 1: 10 minutes walking daily ○ Phase 2: 30 minutes per day of walking 5+ days per week ○ Phase 3: >30 minutes per day (walking, cycling, swimming) 5+ days per week ○ Phase 4: >30 minutes per day (walking, cycling, swimming, elliptical, stepper) 5+ days per week at position sparing soft tissue repair and pain by compression of patella
Pain and swelling	<ul style="list-style-type: none"> ▪ Ice, compression, and elevation daily after exercises^{1-2, 5-6}
Incision mobility	<ul style="list-style-type: none"> ▪ Soft tissue mobilizations to entire length of incision with greater emphasis on distal 1/3 of incision^{1-2, 5-6} until incision moves freely over subcutaneous tissue³
Vital Signs	<ul style="list-style-type: none"> ▪ Monitoring during each session²



Total Knee Arthroplasty Rehab Protocol

Timeline	Treatment²	Milestones
Phase 1 0-2 Weeks Post-Operative Visits 1-6	<ul style="list-style-type: none"> ▪ ROM² <ul style="list-style-type: none"> ○ Exercise bike for ROM 5-10 minutes, forward and/or backward pedaling with no resistance until able to perform full revolution at the lowest seat height. ○ Supine active-assistive wall slides for knee flexion ROM ○ Passive knee extension stretches with manual pressure ○ Seated bag hang or prone bag hang providing low load long duration stretch (weight and time may vary to achieve goal) ○ Patellar mobilizations all directions as necessary³ *No lateral mobilization secondary to surgical procedure* ▪ NMES^{1-2, 5-6,8}: See end note for guidelines ▪ Volitional strength^{2,10} <ul style="list-style-type: none"> ○ Exercise example: SAQ, standing bilateral 45° squats with UE support, clamshells, side-lying hip abduction, side-lying hip adduction, glute squeezes ▪ Balance/Agility⁹ <ul style="list-style-type: none"> ○ Exercise example: Multi-directional stepping, weight shifting, side-stepping (UE support as needed) 	<ul style="list-style-type: none"> ▪ Able to complete 3x8 reps without fatigue¹⁰ ▪ Pain at rest < 4/10¹⁰ ▪ AROM/PROM <10-90¹⁰ ▪ Independence with mobility in and out of home¹⁰
Phase 2 2-6 Weeks Post-Operative Visits 7-16	<ul style="list-style-type: none"> ▪ ROM² <ul style="list-style-type: none"> ○ Exercise bike for 5-10 minutes, forward and backward pedaling with no resistance until able to perform full revolution at lowest seat height. Once can achieve this add resistance. ○ Supine active-assistive wall slides for knee flexion ROM ○ Passive knee extension stretch with manual pressure ○ Seated bag hang or prone bag hang providing low load long duration stretch (weight and time may vary to achieve goal) ○ Patellar mobilizations all directions as necessary³ *No lateral mobilization secondary to surgical procedure* ▪ NMES^{1-2, 5-6,8}: See end note for guidelines ▪ Volitional Strength^{2,10} <ul style="list-style-type: none"> ○ Exercise example: LAQ, SLR, clamshells, side-lying hip abduction, step-ups/side step-ups/step-downs/step-up and overs at 5-15 cm, sit to stand, bilateral calf raises standing TKE with Theraband™ for resistance from 45-0°, standing hamstring curls ○ Increase step height if good concentric/eccentric control ▪ Balance/Agility⁹ <ul style="list-style-type: none"> ○ Exercise example: Marching (decrease UE support), backward walking, forward lunges (progress depth and decrease UE support) 	<ul style="list-style-type: none"> ▪ AROM/PROM 0° to > 105° of flexion² ▪ Minimal to no pain and swelling² ▪ Voluntary quadriceps muscle control or 0° knee extension lag² ▪ Heel strike/push off achieved with least restrictive device. ▪ Begin focusing on TKE in stance phase of gait. ▪ Obtain baseline isometric quadriceps index, and activation with a superimposed electrical stimulation burst at the end of week four.
Phase 3 5-8 Weeks Post-Operative Visits 16-21	<ul style="list-style-type: none"> ▪ ROM² <ul style="list-style-type: none"> ○ Exercise bike for 5-10 minutes, add resistance if able to perform full revolution, lower seat height to produce stretch with each revolution ○ Continue ROM activities as described in phase 2 treatment section with increased duration until milestones are achieved ▪ NMES^{1-2, 5-6,8}: See end note for guidelines ▪ Volitional Strength^{2,10} <ul style="list-style-type: none"> ○ Exercise example: LAQ with ankle weight, standing hamstring curls with ankle weights, standing 4-way hip with UE support, 	<ul style="list-style-type: none"> ▪ Consistent with carryover of AROM 0° to >115° ▪ Collaborate with surgeon if by 4-6 weeks post-op carryover of AROM in flexion is less than 10°-15° from initial outpatient PT evaluation measurement. ▪ Steady increase in MVIC³



	<p>bilateral calf raises, ball wall slides, step-ups/side step-ups/step-downs/step-up and overs</p> <ul style="list-style-type: none"> ▪ Balance/Agility⁹ <ul style="list-style-type: none"> ○ Balance board stance, forward lunging, SLS eyes open (progress surface), grapevine, figure-8 walking (progress volume and speed) 	
<p>Phase 4 7-10 Weeks Post-Op Visits 22-28</p>	<ul style="list-style-type: none"> ▪ ROM² <ul style="list-style-type: none"> ○ Continue as previously described until milestones are achieved ▪ NMES^{1-2, 5-6, 8}: See end note for guidelines ▪ Volitional Strength^{2, 10} <ul style="list-style-type: none"> ○ Exercise example: Machine leg extension, machine leg curls, supine stability ball hip extension progression, standing 4-way hip with reduced UE support progressing to no support, machine leg press, machine calf press, wall slides with hold. ▪ Balance/Agility⁹ <ul style="list-style-type: none"> ○ Exercise example: Star excursion foot reach, SLS with eyes closed (re-start SLS progression), side shuffles, grapevine, figure-8 walking, backward walking (progress volume and speed). ▪ Prior to discharge <ul style="list-style-type: none"> ○ Review and practice safe kneeling with patient during one session. ○ Provide handouts to patient on safe kneeling, local gyms, risk of weight gain following TKA, and nutrition. 	<ul style="list-style-type: none"> ▪ AROM 0-120° ▪ Walk foot over foot up and downstairs without assistive device ▪ Unlimited walking distance with normalized gait and least restrictive device ▪ Retest isometric quadriceps index and activation. Quadriceps at 70% strength of uninvolved side

ROM: range of motion; AROM: active range of motion; PROM: passive range of motion; > greater than; reps: repetitions; SLR: straight leg raise; RM: repetition maximum; TKE: terminal knee extension; SAQ: short-arc quadriceps; MVIC: maximum volitional isometric contraction; PT: physical therapy; SLS: Single limb stance



NMES Protocol Guidelines^{1,2,5,6,8}

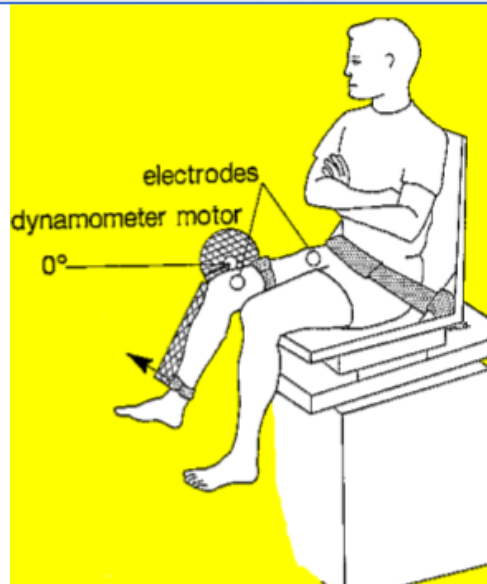
At home

- To be performed twice a day for the first 6 weeks
- Secure the lower limb with Velcro straps to a stable chair to allow for about 85° of hip flexion and 60° of knee flexion
- Electrodes placed over proximal lateral quadriceps and distal medial quadriceps
- Stimulation parameters: 250 usec, symmetrical waveform, 50 Hz, 3 second ramp, 15 seconds on, 45 seconds off, intensity to maximum tolerable and patient should be encouraged to increase the intensity throughout to tolerance



In the clinic

- Stimulation Parameters: 250-400 usec, 50-75 Hz, 2 second ramp, 12 second on, 50 second off, intensity to maximum tolerable or at least 30% of the maximum volitional isometric contraction (MVIC), 15 contractions per session
- 3 sessions per week until quadriceps strength MVIC is 70% of uninjured.
- Performed isometrically at 0-60 degrees of knee flexion—dependent on tolerance and therapeutic goal (i.e. near max extension for quad lag, etc.)





References

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- 2.) Meier, W. et al. Total Knee Arthroplasty: Muscle Impairments, Functional Limitations, and Recommended Rehabilitation Approaches. *J Orthop Sports Phys Ther.* 2008;38(5):246-256
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- 4.) Petterson S, Snyder-Mackler L. The use of neuromuscular electrical stimulation to improve activation deficits in a patient with chronic quadriceps strength impairments following total knee arthroplasty. *J Orthop Sports Phys Ther.* 2006;36:678-684.
- 5.) Snyder-Mackler L, Delitto A, Stralka SW, Bailey SL. Use of electrical stimulation to enhance recovery of quadriceps femoris muscle force production in patients following anterior cruciate ligament reconstruction. *Phys Ther.* 1994;74:901-907.
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