



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

**Primary Surgery:** Tricompartmental, TKA-any approach

**Assumptions:** 3-4 weeks post-tricompartmental TKA, up to 1 week of inpatient rehabilitation after acute care stay, up to 2 weeks (4-6 visits) of home physical therapy<sup>1-2, 5-6</sup>

**Assumptions for outpatient physical therapy:** Active range of motion (AROM) approaching 90° of knee flexion, minimal pain/swelling, independence in mobility in and out of home<sup>2</sup>

**Expected number of visits:** 16-18 visits

Time	Treatment <sup>2</sup>	Milestones
<p><b>Early</b></p> <p><b>3-6 Weeks Post-Operatively</b></p> <p><b>Visits 1-6</b></p>	<p><b>ROM<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Exercise bike for 5-10 minutes, forward and backward pedaling with no resistance until able to perform full revolution</li> <li>Supine, active-assistive wall slides or prone quadriceps stretch with strap for knee flexion</li> <li>Passive knee extension stretch with manual pressure or weights (seated bag hang, or prone bag hang)</li> <li>Patellar mobilizations for 3 sets of 10 reps of inferior, superior glides, medial, and lateral glides as necessary<sup>3</sup></li> </ul> <p><b>NMES<sup>1-2, 5-6</sup>: See end note for guidelines</b></p> <p><b>Volitional Strength<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Strengthen at 70% of 8 RM with 3 sets of 8 reps for all strengthening exercises</li> <li>Initial exercise examples: SLR, hip abduction sidelying, SAQ, step-ups at 5-15 cm, 45° wall slides or sit to stand, standing TKE with Theraband™ for resistance from 45-0°</li> <li>Increase step height if good concentric/eccentric control</li> </ul>	<p>AROM/PROM 0° to &gt; 105° of flexion<sup>2</sup></p> <p>Minimal to no pain and swelling<sup>2</sup></p> <p>Voluntary quadriceps muscle control or 0° knee extension lag<sup>2</sup></p> <p>Heel strike/push off achieved with least restrictive device.</p> <p>Begin focusing on TKE in stance phase of gait.</p> <p>Obtain baseline isometric quadriceps index, and activation with a superimposed electrical stimulation burst within the first week of outpatient PT.</p>
<p><b>Mid</b></p> <p><b>5-8 Weeks Post-Operatively</b></p> <p><b>Visits 7-12</b></p>	<p><b>ROM<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Exercise bike for 5-10 minutes, add resistance if able to perform full revolution, lower seat height to produce stretch with each revolution</li> <li>Continue ROM activities as described in early treatment section with increased duration until milestones are achieved</li> </ul> <p><b>NMES<sup>1-2, 5-6</sup>: See end note for guidelines</b></p> <p><b>Volitional Strength<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Continue to progress exercises if able to perform 3 sets of 10 reps of the exercise correctly with maximum fatigue</li> </ul> <p>Progression:</p> <ul style="list-style-type: none"> <li>Progress from 8RM to 10 RM</li> <li>Reassess 10RM weekly and exercise at 65% - 70% 10RM</li> </ul>	<p>Consistent with carryover of AROM 0° to &gt;115°</p> <p>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.</p> <p>Steady increase in MVIC<sup>3</sup></p>

	<ul style="list-style-type: none"> <li>Exercise examples: Leg press and leg extension at 65-70% 1 RM, 4-way hip exercises with resistance, climbing a flight of stairs, walking with change in speed and incline.</li> </ul>	
<p><b>Late</b></p> <p><b>7-10 Weeks Post-Operatively</b></p> <p><b>Visits 13-18</b></p>	<p><b>ROM<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Continue as previously described until milestones are achieved</li> </ul> <p><b>NMES<sup>1-2, 5-6</sup>: See end note for guidelines</b></p> <p><b>Volitional Strength<sup>2</sup></b></p> <ul style="list-style-type: none"> <li>Continue to progress exercises if able to perform 3 sets of 10 reps of the exercise correctly with maximum fatigue</li> </ul>	<p>AROM 0-120<sup>77</sup></p> <p>Walk foot over foot up and downstairs without assistive device</p> <p>Unlimited walking distance with normalized gait and least restrictive device</p> <p>Retest isometric quadriceps index and activation.</p> <ul style="list-style-type: none"> <li>Quadriceps at 70% strength of uninvolved side</li> </ul>
<p>ROM: range of motion; AROM: active range of motion; PROM: passive range of motion; &gt; 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</p>		

### Pain and swelling

Ice, compression, and elevation daily after exercises<sup>1-2, 5-6</sup>

### Incision mobility

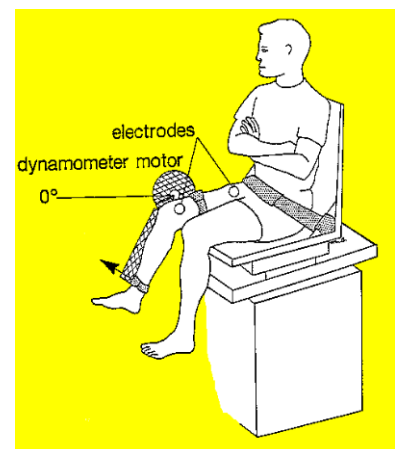
Soft tissue mobilizations to entire length of incision with greater emphasis on distal 1/3 of incision<sup>1-2,5-6</sup> until incision moves freely over subcutaneous tissue<sup>3</sup>

### Vital Signs

Monitored during each session<sup>2</sup>

### NMES Protocol Guidelines<sup>1,2,5,6</sup>

- Electrodes placed over proximal lateral quadriceps and distal medial quadriceps
- Stimulation Parameters: 250-400 usec, 50-75 Hz, 2 second ramp, 12 second on, 80 second off, intensity to maximum tolerable or at least 30% of the maximum volitional isometric contraction (MVIC), 10 contractions per session
- 3 sessions per week until quadriceps strength MVIC is 70% of uninvolved.
- Performed isometrically at 0-60 degrees of knee flexion—dependent on tolerance and therapeutic goal (ie. near max extension for quad lag, etc.)



### References

1. Lewek M, Stevens J, Snyder-Mackler L. The use of electrical stimulation to increase quadriceps femoris muscle force in an elderly patient following a total knee arthroplasty. *Phys Ther.* 2001;81:1565-1571.
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
3. Mizner, R., Petterson, S., Snyder-Mackler, L. Quadriceps Strength and Time Course of Functional Recovery after Total Knee Arthroplasty. *J Orthop Sports Phys Ther.* 2005;35(7):424-436.
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. *Phy Ther.* 1994;74:901-907.
6. Stevens JE, Mizner RL, Snyder-Mackler L. Neuromuscular electrical stimulation for quadriceps muscle strengthening after bilateral total knee arthroplasty: a case series. *J Orthop Sports Phys Ther.* 2004;34:21-29.
7. Kurosaka M, Yoshiya S, Mizuno K, Yamamoto T. Maximizing flexion after total knee arthroplasty: the need and the pitfalls. *J Arthroplasty.* 2002; 17(4 suppl): 59-62.

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