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

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

**Expected number of visits:** Dependent on when patient begins physical therapy can range from 16-28 visits

**Recommended progression of strengthening exercises**:
- 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.

<table>
<thead>
<tr>
<th>Time</th>
<th>Treatment</th>
<th>Milestones</th>
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<tbody>
<tr>
<td><strong>Phase 1</strong></td>
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</table>
| 0-2 Weeks Post-Operatively | **ROM**<sup>2</sup>  
- 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 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 necessary<sup>3</sup>  
- NMES <sup>1-2, 5-6, 8</sup>: See end note for guidelines  
- Volitional strength<sup>2, 10</sup>  
- Exercise example: SAQ, standing bilateral 45° squats with UE support, clamshells, side-lying hip adduction, glute squeezes  
- Balance/Agility<sup>9</sup>  
- Exercise example: Multi-directional stepping, weight shifting, side-stepping (UE support as needed) | Able to complete 3x8 reps without fatigue<sup>10</sup>  
Pain at rest <4/10<sup>10</sup>  
AROM/PROM <10-90<sup>10</sup>  
Independence with mobility in and out of home<sup>10</sup> |
| **Phase 2** | | |
| 2-6 Weeks Post-Operatively | **ROM**<sup>2</sup>  
- 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 necessary<sup>3</sup>  
- NMES <sup>1-2, 5-6, 8</sup>: See end note for guidelines  
- Volitional Strength<sup>2, 10</sup>  
- Exercise example: LAQ, SLR, clamshells hip abduction sidelying, step-ups/side step ups/ step downs/step up and overs at 5-15 cm, sit to stand, bilateral calf raises standing | AROM/PROM 0° to > 105° of flexion<sup>2</sup>  
Minimal to no pain and swelling<sup>2</sup>  
Voluntary quadriceps muscle control or 0° knee extension lag<sup>2</sup>  
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. |

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<table>
<thead>
<tr>
<th>Phase 3</th>
<th>5-8 Weeks Post-Operatively Visits 16-21</th>
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<tbody>
<tr>
<td>ROM²</td>
<td>• 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</td>
</tr>
<tr>
<td>NMES¹,²,⁵,⁶,⁸; See end note for guidelines</td>
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<tr>
<td>Volitional Strength²,¹⁰</td>
<td>• Exercise example: LAQ with ankle weight, standing hamstring curls with ankle weights, standing 4-way hip with UE support, bilateral calf raises, step ups/side steps ups/steps downs/step up and overs</td>
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<tr>
<td>Balance/Agility⁹</td>
<td>• Balance board stance, forward lunging, SLS eyes open (progress surface), grape vine, figure 8 walking (progress volume and speed)</td>
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<tr>
<th>Phase 4</th>
<th>7-10 Weeks Post-Operatively Visits 22-28</th>
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<tr>
<td>ROM²</td>
<td>• Continue as previously described until milestones are achieved</td>
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<tr>
<td>NMES¹,²,⁵,⁶,⁸; See end note for guidelines</td>
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</tr>
<tr>
<td>Volitional Strength²,¹⁰</td>
<td>• 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.</td>
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<tr>
<td>Balance/Agility⁹</td>
<td>• Exercise example: Star excursion foot reach, SLS with eyes closed (re-start SLS progression), side shuffles, grape vine, figure 8 walking, backward walking (progress volume and speed).</td>
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<td></td>
<td>Consistent with carryover of AROM 0° to &gt;115°</td>
<td>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.</td>
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<td>Steady increase in MVIC³</td>
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Prior to discharge

- 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.

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

Patient Education:

- 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 Program:

- First month post-op exercises 2x daily, afterwards 1x daily, at discharge 3-5x/week based on recovery.
- Home activity:
  - 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

Pain and swelling

Ice, compression, and elevation daily after exercises

Incision mobility

Soft tissue mobilizations to entire length of incision with greater emphasis on distal 1/3 of incision until incision moves freely over subcutaneous tissue

Vital Signs

Monitored during each session
NMES Protocol Guidelines\textsuperscript{1,2,5,6,8}

At home: \textit{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: 250usec, 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 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

11. Jenkins C1, Barker KL, Pandit H, Dodd CA, Murray DW. After partial knee replacement, patients can kneel, but they need to be taught to do so: a single-blind randomized controlled trial. Phys Ther. 2008 Sep;88(9):1012-21.

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