ACLR Rehabilitation
Saint Louis University – SSM Health Physical Therapy Orthopedic Residency
in Collaboration with
Christopher Kim, MD & Scott Kaar, MD

These guidelines, treatments, and milestones have been established to assist in guiding rehabilitation based on the most current available evidence. They are not intended to be substitute for sound clinical judgement with consideration of the individual contextual features of the patient and the demands of various functions/sports.

Pre-operative goals: Full knee extension range of motion (ROM), absent or minimal joint swelling, no knee extension lag with straight leg raise (SLR), educate the patient on what to expect following surgery, and protect the joint.

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Milestones</th>
<th>Treatment Recommendations</th>
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<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td><strong>AROM/PROM = 0-90°</strong>&lt;br&gt;o Recommend not emphasizing hyperextension equal to contralateral side, as patient should achieve this over time&lt;br&gt;• Active quadriceps contraction with superior patellar glide</td>
<td>• Wall slides&lt;br&gt;• Patellar mobilization&lt;br&gt;• Gait training&lt;br&gt;• Stationary bike for ROM Home Program&lt;br&gt;• Self applied ROM&lt;br&gt;• Self patellar mobilizations&lt;br&gt;• Quad sets&lt;br&gt;• Long arc quads (90–30° flexion)&lt;br&gt;• SLR [may use electrical stimulation to assist with quad activation]³³</td>
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<tr>
<td>(Day 0-7)</td>
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<td><strong>Week 2</strong></td>
<td><strong>Flexion &gt;110°</strong>&lt;br&gt;• Gait without crutches&lt;br&gt;• Use of bike without difficulty&lt;br&gt;• Walking with full extension&lt;br&gt;• Reciprocal stair climbing (with hand rail use)&lt;br&gt;• Maintain knee extension of 0°&lt;br&gt;• Double limb sit to stand from 17” seat</td>
<td>• Step ups in pain free ROM&lt;br&gt;• Scar mobilizations when skin is healed&lt;br&gt;• Wall squats/sits&lt;br&gt;• Prone hangs or bag hangs for full extension ROM (if not already achieved)&lt;br&gt;• Patellar mobilizations in flexion (if flexion ROM limited)</td>
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<td>(Day 7-14)</td>
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<tr>
<td><strong>Weeks 3-5</strong></td>
<td>**Flexion to within 10° of contralateral&lt;br&gt;Reciprocal stair climbing (without hand rail use)&lt;br&gt;Quad strength 4+/5 or greater (test @ 45° flexion)&lt;br&gt;Maintain knee extension of 0°&lt;br&gt;Within one SD of 5x Sit to Stand test norm for age group⁷</td>
<td>• Patellar &amp;/or Tibiofemoral mobilizations (as appropriate)&lt;br&gt;• Progress bike and stair master duration to 10-minute minimum&lt;br&gt;• Begin balance and proprioception</td>
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<td>(Day 14-35)</td>
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## ACLR Rehabilitation

| Weeks 6-8 (Day 35-56) | • Normalized gait pattern  
• Full ROM compared to contralateral (recommend not emphasizing hyperextension)  
• No greater than 1+ effusion using the Stroke test$^{25}$  
• 5x Sit to stand: normal values for age group$^7$  
• $\leq 2$ errors on SL squat$^{3,15}$ | • Progressive resistive exercises  
• Begin running progression on treadmill (progression based on the Soreness Rules)$^{10}$ |
| Weeks 9-12 (Day 56-84) | • Hop tests $>85\%$  
• Maintain ROM  
• Trace to Zero effusion grade using the stroke test  
• $\leq 1$ errors on SL squat (week 10)$^{3,15}$  
• Zero errors on SL squat (week 12)$^{3,15}$ | • Sport specific exercises  
• Agility activities  
• Functional testing  
• Closed chain core strengthening  
• Running progression |
| Weeks 13- Return to Sport | • All hop tests symmetry $>90\%$$^{11}$  
• Modified Star Excursion Balance Test symmetry $\leq 4cm$$^{14}$  
• Acute to chronic workload ratio $< 1.5^{13,16,17}$ | • Sport specific exercises  
• Agility activities  
• Functional testing  
• Closed chain core strengthening  
• Running progression |
| Follow up functional testing | • 4, 5, 6, and 12-month post-op testing  
• Progression towards power activities as needed | • Maintain gains in strength  
• Hop tests (90-100% of contralateral)  
• Maintain ROM |

### Precautions/Additional information

**Graft protection:**

- Brace use and graft type are at the discretion of the surgeon.
- Stress to ACL with passive ROM $0-120^\circ$ is minimal. Most strain occurs in last $30^\circ$ of NWB extension$^{2,5,9,15}$.

**Adjunct treatments:**

- NMES may be instrumental in improving muscular performance for those not responding to traditional strengthening$^{33}$.
- If concomitant injury present at the same time, that injury dictates rehab progression:
  - meniscal injury with repair:
    - Full PROM is allowed. Ambulate WBAT with brace locked at $0^\circ$ until week 5
    - No loaded knee flexion beyond $45^\circ$ until week 5, none beyond $90^\circ$ until week 8
    - No forced knee hyperextension if anterior horn repair /No forced knee flexion if posterior horn repair
    - Avoid OKC exercise from $0-30^\circ$ and CKC exercise from $90-120^\circ$ if patient shows signs/symptoms of patellofemoral irritation$^{4,5}$
  - chondral damage: restrict WB for 3-4 weeks to avoid stressing the healing cartilage. Beware that prolonged weight bearing restriction may result in difficulty recovering ROM and quad activation$^{20}$.
  - partial meniscectomy: no modification of guideline (symptom management)$^{12}$.

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- MCL: If surgical repair, avoid directly stressing the MCL, and consider sagittal plane limitations if needed. If needed, consider PCL guidelines.

Treatment Progression/Success:
- Factors that can impact rehabilitation success include the following: psychosocial issues, motivation, swelling, quad activation failure, acute reconstruction, involvement of other structures.
- Success measured by: 1. Less than mild effusion, 2. >90% hamstring and 3. quad strength, 4. Absence of giving way episodes, 5. Participation in 1-2 seasons of sports at previous activity level, 6. Patient reported outcomes.
- Patient Reported Outcome Measure: Consider using SANE score, as it correlates well with Cincinnati Knee Rating System.
- Consider using Stoke Test Grading for Effusion to determine whether to progress. Use this tool to assist with grading activity. *Increased effusion by 2 grades would lead to a decrease in activity until the effusion decreases to the previous level.*
- Weight bearing exercises alone are not enough for optimal outcomes. Graded increases in load, appropriate to the phase of healing, should be considered.

For questions regarding the patient’s medical care, new orders, or insurance questions:
- **Dr. Kaar's patients** should contact Meghan at 314-977-1082 or meghan.gehrs@health.slu.edu.
- **Dr. Kim's patients** should contact Julia (clinical nurse specialist) at 314-577-8524 or julia.santiago@health.slu.edu.

For additional questions, comments, or concerns regarding the implementation of these physical therapy guidelines, please contact Chris Sebelski, PT, DPT, PhD, OCS, Director of the SLU – SSM Health Physical Therapy Residency 314 977 8724 OR chris.sebelski@health.slu.edu

Please respond to our anonymous survey regarding these guidelines to assist in improving patient care and advocacy.

https://slu.az1.qualtrics.com/jfe/form/SV_bpX7Z9AaVTzGblj

Appendices of referenced assessments

| Soreness Rules Adapted from Fees et al. 1998^10 |
|----------------|-------------------------------------------|
| **Criterion** | **Action**                                   |
| 1. Soreness during warm-up that continues | 2 days off, drop down 1 step               |
| 2. Soreness during warm-up that goes away | Stay at step that led to soreness          |
| 3. Soreness during warm-up that goes away from redevelops during session | 2 days off, drop down 1 step               |
| 4. Soreness the day after lifting (not muscle soreness) | 1 day off, do not advance program to the next step |
| 5. No soreness | Advance 1 step per week or as instructed by healthcare professional |
ACLR Rehabilitation

- 5xSTS Normative Values

<table>
<thead>
<tr>
<th>Age (n)</th>
<th>Mean ± SD (95%CI)</th>
<th>Min-Max</th>
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<tbody>
<tr>
<td>14–19  (25)</td>
<td>6.5 ± 1.2 (6.0–7.0)</td>
<td>4.7–9.7</td>
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<tr>
<td>20–29 (36)</td>
<td>6.0 ± 1.4 (5.6–6.5)</td>
<td>3.9–11.2</td>
</tr>
<tr>
<td>30–39 (22)</td>
<td>6.1 ± 1.4 (5.5–6.8)</td>
<td>4.1–10.4</td>
</tr>
<tr>
<td>40–49 (15)</td>
<td>7.6 ± 1.8 (6.6–8.6)</td>
<td>5.6–13.2</td>
</tr>
<tr>
<td>50–59 (20)</td>
<td>7.7 ± 2.6 (6.5–8.9)</td>
<td>4.2–12.1</td>
</tr>
<tr>
<td>60–69 (25)</td>
<td>7.8 ± 2.4 (6.8–8.7)</td>
<td>4.7–15.1</td>
</tr>
<tr>
<td>70–79 (24)</td>
<td>9.3 ± 2.1 (8.4–10.1)</td>
<td>5.5–13.3</td>
</tr>
<tr>
<td>80–85 (14)</td>
<td>10.8 ± 2.6 (9.3–12.3)</td>
<td>5.8–17.6</td>
</tr>
</tbody>
</table>

Errors (Impairments) seen in Single Leg Squat Movement Adapted from (Liebenson 2002) in (Bailey et al 2010)

<table>
<thead>
<tr>
<th>Midfoot collapse</th>
<th>Early heel rise</th>
<th>Poor control of knee with ascent</th>
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<tbody>
<tr>
<td>Femoral adduction, IR</td>
<td>Pelvic drop</td>
<td>Excessive trunk flexion or knee extension on ascent</td>
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Running Program:

<table>
<thead>
<tr>
<th>Level</th>
<th>Treadmill</th>
<th>Track</th>
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<tbody>
<tr>
<td>1</td>
<td>0.1-mile walk/0.1-mile jog, repeat 10 times</td>
<td>Jog straights/walk curves (2 miles)</td>
</tr>
<tr>
<td>2</td>
<td>Alternate 0.1-mile walk/0.2-mile jog (2 miles)</td>
<td>Jog straights/jog 1 curve every other lap (2 miles)</td>
</tr>
<tr>
<td>3</td>
<td>Alternate 0.1-mi walk/0.3-mi jog (2 miles)</td>
<td>Jog straights/jog 1 curve every lap (2 miles)</td>
</tr>
<tr>
<td>4</td>
<td>Alternate 0.1-mi walk/0.4-mi jog (2 miles)</td>
<td>Jog 1.75 laps/walk curve (2 miles)</td>
</tr>
<tr>
<td>5</td>
<td>Jog full 2 miles</td>
<td>Jog all laps (2 miles)</td>
</tr>
<tr>
<td>6</td>
<td>Increase workout to 2.5 miles</td>
<td>Increase workout to 2.5 miles</td>
</tr>
<tr>
<td>7</td>
<td>Increase workout to 3 miles</td>
<td>Increase workout to 3 miles</td>
</tr>
<tr>
<td>8</td>
<td>Alternate between running/jogging every 0.25 miles</td>
<td>Increase speed on straights/jog curves</td>
</tr>
</tbody>
</table>

- Hop tests:

Return to sport dosing should consider Acute-to-chronic workload

Each session calculated by multiplying RPE (0-10) by duration (minutes) to obtain workload (augmented units). For example, RPE of 6 x 60 minutes = workload of 360 AUs.

Acute workload = average workload over the course of 1 week

Chronic workload = average workload over course of 4 weeks

Updated 2019-12-15


