

KNEE ARTHRITIS

Nonoperative Physical Therapy Protocol · 6–12 Weeks

PATIENT

PHYSICIAN

Andrew L. Merritt, MD

DATE OF REFERRAL

PT START DATE

For the patient

This is a **short, focused physical therapy program** for arthritis of the knee. It is also the program to use **before a knee replacement**: the stronger you go into surgery, the stronger you come out. Most of the work happens in the **first 6 weeks, twice a week**, while you learn the exercises and build strength, especially the **quadriceps**, the big muscle on the front of your thigh. After that you taper off and keep going on your own at home or in the gym. **Exercise is the most effective non-surgical treatment for arthritis.** Some soreness is normal: follow the pain rules your therapist teaches you.

PROTOCOL AT A GLANCE

DIAGNOSIS · GOAL	Knee arthritis, or getting ready for a knee replacement. Less pain, a stronger quad, and a program you can keep doing on your own
ACTIVITY	Full activity as tolerated. Low-impact cardio most days. Bike with the seat a little high ; pool, elliptical, flat walking. Cane in the opposite hand if needed
PHYSICAL THERAPY	2× a week for 6 weeks (about 12 visits), then up to 4 more visits over weeks 7–12 if needed
PAIN RULES	Exercise pain up to 5/10 is OK if it settles by the next morning. If it doesn't, ease back the next session. Don't stop exercising
PROGRESSION	Advance when the goals are met, not by the calendar. Discharge as soon as the home or gym program is solid
AFTER PT	Keep strengthening 2–3× a week and cardio 150 min a week for life. Recheck with Dr. Merritt if not better by 6 weeks

Recovery Timeline

Phase	When	PT visits	Focus
1	Weeks 0–2	2× a week	Evaluation, education, pain rules; wake up the quad; restore knee extension; start bike and walking
2	Weeks 2–6	2× a week	Flexibility and progressive strength (squats, step-ups, leg press); balance; cardio toward 30 min a session
3	Weeks 6–12	Every 1–2 weeks, up to 4 visits	Taper to independence: harder single-leg work, gym or home program, retest, discharge (or pre-surgery peak)

Questions about PT? Call our office or ask at your next visit. We are glad to coordinate with your therapist.

For the Therapist

Check the surgeon notes first. They override anything else in this protocol. Questions or setbacks: call (425) 656-5060.

Surgeon notes and special instructions

General principles

- **Scope.** Symptomatic knee OA (any grade; tibiofemoral and/or patellofemoral) in two groups: (1) **conservative care** to reduce pain, improve function, and delay or avoid replacement; (2) **prehab before a planned knee replacement** ("better in, better out"; see the prehab page).
- **Short and front-loaded.** About **12 visits over 6 weeks** (2× a week), then up to 4 taper visits by week 12. This matches GLA:D and ESCAPE-pain and Deyle, NEJM 2020 (about 8 PT visits beat a steroid injection at 1 year). **Discharge early** once the patient runs the program independently. Criteria-based; severe OA or major comorbidities may need a slower pace.
- **Quadriceps first, full extension.** Quad weakness is one of the strongest risk factors for OA progression; an 8-week, 2× a week quad program has matched NSAIDs for pain relief. **VMO activation** early, then closed-chain strength; train hips and both legs. Loss of extension comes first and makes every step harder: goal passive extension 0°, flexion ≥110°.
- **Education is treatment.** Visits 1–2: what arthritis is, why exercise is safe and helps, the pain rules, pacing, joint protection, and weight (each pound lost takes about 4 lb off the knee per step; 5–10% loss if overweight). Address fear-avoidance: consistency beats intensity, and the best exercise is the one the patient keeps doing.
- **Pain rules.** Exercise pain up to **5/10** is fine if it is back to baseline by the next morning (within 24 hours) and not building week to week. If not, reduce load or range; don't stop (see the flare plan).
- **Strength and cardio dose:** progressive strength (build to 8–12 reps at a hard effort, 2–3 sets; add load when 2 more reps are possible), balance, and movement quality. Cardio toward **150 min a week**; cycling preferred, seat a little high. **Patellofemoral-predominant:** comfortable ranges; no squats past 90° or heavy leg extension if painful.
- **Adjuncts:** knee joint mobilization for extension and flexion early, always paired with exercise. **NMES at PT only**, for clear quad inhibition. Moist heat 15–20 min before exercise (not with an acute effusion). Ice or cold compression **20 min on, 20 min off** after exercise or with swelling. Compression sleeve for comfort; unloader brace per Dr. Merritt for one-sided arthritis; cane or poles as needed. **Not recommended:** ultrasound, stand-alone TENS, lateral wedge insoles.
- **Injections and medicines:** per Dr. Merritt. Voltaren gel is a good option for the knee. After a cortisone injection, resume after a few days and use the pain relief as a window to push strength. No cortisone in the 3 months before a knee replacement.

PHASE

1

Learn, Settle, and Activate the Quad

Weeks 0–2

For the patient: what to expect

Your first visits are about **learning**: why exercise helps and how much discomfort is OK. Pain up to **5 out of 10** during exercise is fine if it settles by the next morning. The key job now is to **wake up your quad** and get your knee fully straight. You will start biking and walking and leave with a short home program.

VISITS	2× a week. Visit 1: evaluation, baseline tests, education; conservative care or prehab (note surgery date). Visit 2: education and first full session
ACTIVITY	Full weight bearing; cane in the opposite hand if needed for pain. Walking 15–20 min on flat ground; bike 10–20 min, seat high, low resistance; add 5 min a week. Pool walking from week 2 if available
TESTS	KOOS JR, pain 0–10, 30-sec chair stand, 40-m fast walk, stair climb, knee ROM, quad lag. Repeat at week 6 and discharge

Goals

- Understands the pain rules and the 6–12 week plan
- Good quad set (VMO) and straight-leg raise with no lag
- Full or near-full knee extension
- Home program started 2–3× a week, plus bike or walking most days

Move on when

- ☐ Pain ≤4/10 with walking and daily activities
- ☐ Quad set and SLR with no extensor lag
- ☐ Doing the home program on their own
- ☐ Bike 20 min tolerated; swelling not building

Exercises

Exercise	How
Quad sets	Towel under the knee, VMO focus; 3 × 15, 10-sec holds, several times a day
Straight-leg raises, 4 directions	Flexion first, then abduction, adduction, extension; 3 × 10–15; add 0.5–1 lb a week
Heel prop, heel slides	Heel prop 3–5 min if extension is lacking; heel slides 3 × 15, full comfortable arc
Short-arc quads	2–3 × 10–15 over a bolster
Sit-to-stand	Raised seat if needed, arms crossed; 2–3 × 10
Hip strength	Bridges, side-lying abduction, clamshells; 2–3 × 10–15
Balance · Cardio	Single-leg stance at a counter 3 × 20–30 sec · bike, pool, or walking 10–20 min most days

Precautions

- No high-impact exercise; no loaded deep squats, lunges, or kneeling if they flare symptoms; no forcing motion into pain
- Pool: not with open wounds, an unhealed injection site, or infection

PHASE

2

Flexibility and Build Strength

Weeks 2–6

For the patient: what to expect

The exercises get harder: stretching, squats, step-ups, leg press, bands, and balance work. Keep your home program **2–3 times a week** and build biking, walking, or pool time toward **30 minutes a session** and **150 minutes a week**. By week 6 you should have a routine you can do on your own.

VISITS	2× a week (about 12 visits total by week 6). Retest at week 6
LOADING	Progress resistance when 2 more reps are possible at the end of a set. Build to 8–12 reps at a hard effort, 2–3 sets. Leg press load up about 10% every 1–2 weeks
FLEXIBILITY	Hamstrings, quads, calves, IT band and hip flexors; 3 × 30 sec each, 1–2× a day
CARDIO	Build to 30 min a session and 150 min a week (about 30 min, 5 days): bike, pool (2× a week if available), elliptical, flat walking. Recumbent bike if upright hurts

Goals

- Passive extension 0°; flexion ≥110° (or equal to the other side)
- Step-up on a 4-inch step without the rail
- Normal walking on level ground without a cane
- Better chair stand, walk and stair tests, and KOOS JR
- Independent with the full program; knows the flare plan

Move on when

- ☐ Pain ≤3/10 with moderate activity
- ☐ Motion goals met
- ☐ Bike or walking 30 min a session
- ☐ Program done correctly on their own

Exercises

Exercise	How
Mini-squats, wall slides	0–45°, VMO focus; 3 × 15 or 3 holds of 30 sec; add load as tolerated
Step-ups	Forward and lateral, 4-inch step, rail at first; 3 × 10 each; progress to 6 inches
Leg press	Both legs, 0–60°; 3 × 12, light to moderate load
Seated knee extension	Short arc (0–30°), or full arc if no patellofemoral arthritis; pain-free arc only; 3 × 12
Hip abduction and extension, loaded	Band side-lying and standing, band walks, cable or machine; 3 × 10–15
Calf raises · Core	Both legs, then single leg 3 × 15 · bridges (then single leg), dead bug, plank 30–60 sec
Balance	Single-leg progressions, tandem walking; 3 × 30 sec

Precautions

- No deep squats past 90° if patellofemoral arthritis or if they hurt; leg extension in the pain-free arc only
- Ease back the next session if pain or swelling does not settle by morning

PHASE

3

Progress, Independence, and Discharge

Weeks 6–12

For the patient: what to expect

You now do most of the program on your own. Visits drop to every 1–2 weeks to check progress and make the exercises harder, including **single-leg work and bigger steps**. **Many people finish at 6–8 weeks** with a routine they keep for the long run. If a knee replacement is planned, this is where you reach your **best possible strength** before surgery.

VISITS	Every 1–2 weeks, up to 4 visits. Discharge as soon as the goals are met; many patients finish at 6–8 weeks. Prehab patients may save a visit for 4–6 weeks before surgery
PROGRAM	Home or gym program 2–3× a week, plus 150–300 min a week of cardio (30–45 min, 3–5 days). Written or app-based program with progressions

Goals

- Stairs without the rail, step over step
- 8-inch step-down with good control and no pain
- Quad strength building toward the discharge targets
- Independent, progressive long-term program and flare plan
- Final retest: KOOS JR, pain, chair stand, walk and stair tests

Move on when

- ☐ Meets discharge criteria (see the discharge page)

Exercises

Exercise	How
Squats, progressed	Depth up to 90° as tolerated; goblet or dumbbell; 3 × 8–12
Step-ups and step-downs	Forward and lateral, 6–8 inch; slow 4-count lowering; watch for the knee caving in; 3 × 10
Single-leg mini-squat · leg press	0–45°, level pelvis, knee over toes 3 × 10 each · single-leg press at lower load
Hamstrings and posterior chain	Romanian deadlift (both legs, then single leg), hamstring curls; 3 × 8–12
Balance	Foam pad, Bosu, single-leg perturbation; 3 × 30–60 sec
Optional	Blood flow restriction training (about 20% 1RM) for quad and hamstring strength with low joint load

Precautions

- Watch for more swelling as loads rise; reduce load and reassess if it builds
- No running, jumping, or sport-specific impact without Dr. Merritt's clearance
- Not improving by 6 weeks, or worse: send a note to Dr. Merritt before continuing

Flare Plan

Flares are expected. Ease back; don't stop.

DURING A FLARE	Cut strengthening intensity by 30–50%. Keep gentle motion, stretching, and low-level cardio (bike, pool)
ICE AND REST	Ice or cold compression 20 min on, 20 min off after exercise and as needed. Temporarily more rest and less high-load activity. Re-evaluate within 1 week
CALL DR. MERRITT	Flare lasting more than 1 week without improvement, new swelling, or locking or giving way

Prehab Before Knee Replacement

Better in, better out. The stronger you go into surgery, the stronger you come out.

Prehab improves early results after knee replacement (shorter hospital stay, faster early recovery, and better strength at 3 months). Use the same phases, with the focus on the quad (VMO), full extension, swelling, and normal walking. Surgery ideally falls 4–6 weeks after the patient reaches their best pre-surgery level.

TARGETS BEFORE SURGERY	Quad as strong as achievable ($\geq 60\%$ body weight or $\geq 70\%$ of the other side); passive extension 0° , equal to the other side; walking on level ground without a cane; step-over-step stairs with a rail; cardio 30 min a session
4–6 WEEKS BEFORE SURGERY	Final optimization visit; confirm quad strength and walking tolerance; review the expected motion, walking, and milestones after surgery. No cortisone injection in the 3 months before surgery
UNTIL SURGERY	Keep the home strength and cardio program going until 1 week before surgery
AFTER SURGERY	Post-op PT starts 5–7 days after surgery, 2× a week. Schedule it (ideally with the same therapist) before the surgery date

Discharge and When to Call

Finish PT as soon as the patient can run the program on their own. The targets below guide progress; the home program continues toward any not yet met.

Measure	Target
Quad strength	≥60% body weight (isokinetic) or ≥70% of the other side
Pain	≤3/10 with walking, stairs, and daily tasks
Motion	Passive extension 0°; flexion ≥110° or equal to the other side
Stairs	8-inch step up and down without the rail, step over step, no pain
Chair rise	Up from a standard 17-inch chair without arms, 5 times
Walking · Cardio	30+ min on level ground without significant pain or a cane · 30–45 min low-impact, 3–5 days a week
Home program	Independent, 2–3× a week, with a flare plan

DISCHARGE WHEN	Independent with the home or gym program; pain and KOOS JR better than baseline; knows the flare plan. Usually 6–8 weeks, no later than 12. Community options include arthritis pool classes, Silver Sneakers, gym membership
REPORT TO DR. MERRITT	Baseline and discharge scores (KOOS JR, pain 0–10, 30-sec chair stand, 40-m walk, stair test), number of visits, and the home program given. Dr. Merritt check at program completion, or 4–6 weeks before surgery if planned
CALL SOONER IF	No meaningful improvement by 6 weeks; hot or very swollen joint; new locking or giving way; worsening night or rest pain; fever; calf pain or swelling