



QUICK Guides

for post-acute rehabilitation after total knee replacement surgery

There are 10 QUICK guides representing the 10 quality indicators (QIs) for the post-acute phase of rehabilitation after primary total knee replacement for osteoarthritis. Use the guides for a QUICK review of the evidence supporting the QIs, suggestions for tools and resources, and results of our Canada wide survey on rehabilitation care based on these indicators.

In the online PDF, click on the list of QIs to go directly to that QUICK guide. You can also print select QIs by using the print function.

- Rationale
- Appropriate tools
- Resources
- Evidence summary
- Supporting evidence
- Survey findings



TKR POST-ACUTE QUALITY INDICATORS

IF a patient had a primary total knee replacement for osteoarthritis THEN...

QI-1: Assess and document surgical knee pain at start and prior to discharge using a standardized tool

QI-2: Perform and document a comprehensive physical exam at start and prior to discharge using standardized methods

QI-3: Assess and document physical function at start and prior to discharge using a standardized self-report tool

QI-4: Assess and document physical function at start and prior to discharge using a standardized performance-based tool

QI-5: Assess and document participation (work, leisure, sport, caregiving) using a standardized tool

QI-6a: Assess and document physical activity and sedentary behaviour using standardized tools

QI-6b: Provide tailored guidance and support to resume an active lifestyle

QI-7: Assess and document health-related quality of life using a standardized tool

QI-8: Prescribe and document physical therapy and therapeutic exercise that is individualized to patient's needs

QI-9: Provide a comprehensive therapeutic rehabilitation program

QI-10: Assess and document patient's experience and satisfaction with rehabilitation

QI-1

Assess and document surgical knee pain at start of rehab and prior to discharge using a standardized tool

Rationale

Persistent pain is common after TKA (~20%). Higher levels of pain are associated with worse functional outcomes, depression, poorer general health and lower satisfaction. Even an average of 7.5 years post-TKA, 26% of patients had chronic pain of which 50% also had neuropathic pain. Pain catastrophizing and anxiety markedly decreased in the first 6 months after surgery and increased only slightly in the long term.

Assessing and documenting a patient's pain (i.e., at rest, during activity) over the course of rehabilitation can guide clinical care, choice of treatment interventions and determine effectiveness of pain management strategies. Change in pain is the main determinant of change in self-reported physical function. Persistent pain decreases a patient's likelihood of returning to physical activity. Factors that can contribute to persistent pain include pre-existing anxiety, depression and pain catastrophizing.

Appropriate tools to measure pain

- Visual analogue scale (VAS) (100 mm line)
- Numeric pain rating scale (NPRS) (0 to 10)
- P4 Pain Questionnaire
- Pain subscale of Knee injury and Osteoarthritis Outcome Score (KOOS)*
- Pain subscale of WOMAC OA Index*

*Requires permission and/or licensing fee to use



- What is most important to the patient? Pain at rest? Pain with walking?
- Measure pain at the same time each session (before treatment, after treatment)

Resources

[Total Joint Arthroplasty Outcome Measures \(TJAOM\) Toolkit 2.0](#)

[Rehabilitation Measures Database](#)

[Physiopedia - VAS](#)

[Physiopedia - P4](#)

Evidence summary

Delphi panel recommended that a patient's pain level at rest and with activity be routinely assessed at the start and prior to discharge from post-acute rehab using standardized tools.

Supporting evidence

Chan EY, Blyth FM, et al. Acute postoperative pain following hospital discharge after total knee arthroplasty. *Osteoarthritis Cartilage*. 2013;21(9):1257-63. PMID: [23973139](#)

Ghoshal A, Bhanvadia S, et al. Factors associated with persistent postsurgical pain after total knee or hip joint replacement: A systematic review and meta-analysis. *Pain Rep*. 2023;8:e1052. PMID: [36699992](#)

Philips JRA, Hopwood B, et al. The natural history of pain and neuropathic pain after knee replacement. *Bone Joint J*. 2014;96-B(9):1227-33. PMID: [25183595](#)

Priol R, Pasquier G, et al. Trajectory of chronic and neuropathic pain, anxiety and depressive symptoms and pain catastrophizing after total knee replacement. Results of a prospective, single-center study at a mean follow-up of 7.5 years. *Orthop Traumatol Surg Res*. 2023;109(5):103543. PMID: [36608901](#)

Westby MD, Brittain A, et al. Expert consensus on best practices for post-acute rehabilitation after total hip and knee arthroplasty: A Canada and United States Delphi study. *Arthritis Care Res*. 2014;66(3):411-23. PMID: [24023047](#)

Wylde V, Hewlett S, et al. Persistent pain after joint replacement: prevalence, sensory qualities, and postoperative determinants. *Pain*. 2011;152(3): 566-72. PMID: [21239114](#)

Survey* says...

- **89%** of clinicians routinely assess post-operative knee pain **using a standardized tool**
- **80%** rated this as **very important** and **63%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

QI-2

Perform and document a comprehensive physical exam at the start and prior to discharge using standardized methods

Rationale

Varied and persistent impairment including muscle weakness, altered gait, and poor balance are common for several months following TKR and limit physical activity, participation and patient satisfaction. Good ROM is needed for day-to-day function. We know that 110° of knee flexion is needed to complete most ADLs: 87-99° to ascend stairs, 99° to sit on a standard chair, 105° to tie shoes and 117° to lift object from floor. Even greater range is required in non-Western cultures. In one Australian study, initial active knee flexion of 80° 1-2 weeks post-op was suggested as the necessary range to achieve an acceptable 100° active flexion at 7 weeks post-op. Soft tissue contractures and tightness are also common and persist from the pre-operative phase.

In the first month after TKR, patients experience global strength loss ranging from 50 to 61% in the operated leg compared to pre-operative levels and quadriceps are 44-68% weaker than the non-surgical side in the first 2 months post-op. Isokinetic quadriceps strength remains 15-29% less than the non-surgical limb 6 months post-TKA and 19-37% lower than healthy age-matched peers as much as 6 years later.

Gait biomechanics remain altered 12-15 weeks post-op including gait velocity, step length asymmetry, single support time and postural sway. These along with increased forward trunk movement affect balance and increase risk of falls. By 24 weeks post-TKR, most gait parameters reached pre-op levels (double support time, step length asymmetry, speed) but follow a slower recovery than step counts and gait speed remained lower (1.0m/sec) than age-matched peers.

Both static and dynamic balance improve to pre-operative levels between 4 and 12 months after surgery, however between 12 and 17% of patients fall in the first year after surgery. Balance is an important contributor to function and quality of life.

Knee effusion is a primary driver of quadriceps inhibition and on its own, a source of nociceptive pain. Swelling peaks 6-8 days post-op and remains ~25% greater than the non-surgical knee 7 weeks post-op.

Use standardized methods to assess and document impairments at the start of the supervised rehab program to accurately capture a patient's baseline status, individualize

treatment, and prescribe and modify therapeutic exercises. Repeat these measures at appropriate intervals and prior to discharge to assess treatment effectiveness, provide feedback to the patient on their progress, and feel confident in the information you share with other members of the patient's healthcare team.

Recommended approaches for assessing each component:

Range of motion (active and passive)

- Use consistent, standardized test positioning, verbal instructions and 12" or long-arm goniometer placement
- Record test position and whether measurement is passive or active ROM
- Include (at a minimum) bilateral knee flexion and extension; hip flexion, extension, abduction, external and internal rotation are also recommended.

Resources [Physiopedia - Goniometry](#)

Muscle length and flexibility

- Assess restrictions in the muscles crossing the joint (rectus femoris, hamstrings) and those contributing to the kinetic chain (hip flexors, tensor fasciae latae, gastroc-soleus complex) for both limbs
- Use consistent positioning, verbal instructions, and standardized methods such as the active or passive knee extension tests in supine for hamstrings, Thomas Test for hip flexors and Ober's test for TFL
- Record method (degrees of motion, distance from plinth), test position (seated, supine, prone) and measure at consistent time (before/after treatment session)

Resources

[Physiopedia – Thomas Test](#)

[Physiopedia – Passive Knee Extension](#)

[Physiopedia – Ober's Test](#)

Muscle strength

Manual muscle testing (MMT)

- Use consistent, standardized patient test position, hand placement, technique (grading system), grading scale (i.e., 0 to 5), "make" or "break" test technique, and verbal instructions
- Record test position (i.e., supine, sitting), joint position (i.e., 90° flexion) if appropriate and grade for both limbs
- Include (at a minimum) bilateral quadriceps, hamstrings, hip flexors, extensors and abductors strength

Resources

[Rehabilitation Measures Database - MMT](#)

[Physiopedia – Strength Testing](#)

Hand-held myometry

- Recommended over manual muscle testing as an objective and clinically feasible method with good intra-rater reliability in adults with knee OA (Kittelson 2021) and excellent relative reliability in patients scheduled for TKR (Roxburgh 2021) with reference values available for quadriceps strength against which to track your patients' recovery. (Graber 2022)
- As above, and recording use of isometric "make test"
- Record whether single test, average of 3 trials, or best of 3 trials and units of measurement (e.g., kg, nM)

Resources:

[Rehabilitation Measures Database - Myometry](#)

[Physiopedia - Myometry](#)

[JOSPT – Myometry blog](#)

Gait

- Assess at a consistent time (before/end of treatment) to avoid gait variation due to treatment-related fatigue or pain
- Consider assessing with/without walking aid (when safe), with/without shoes, at different speeds and on varying slopes
- Record differences in stance and swing phase, step length, step width, and altered lumbopelvic alignment

Resources

[Physiopedia - Gait](#)

Static and dynamic balance

- Test a patient's ability to maintain a stable position and to maintain or return the centre of gravity over the base of support (static balance) using:
 - Functional reach test
 - Single leg stance test
 - **4-stage balance test**
 - Step test
- Assess dynamic balance or a patient's ability to maintain upright posture and maintain or return the centre of gravity over the base of support while moving around (e.g., walking, turning, stepping sideways) using:
 - BESTest, Brief BESTest or MiniBESTest
 - Berg Balance Scale
 - Timed Up & Go
 - Four Square Balance Test

Resources

[TJAOM toolkit](#)

[Rehabilitation Measures Database](#)

Posture and alignment

- Assess static (standing) posture and lumbopelvic and lower limb alignment including presence of scoliosis, hyperkyphosis, reduced lumbar lordosis, pelvic levels and tilt, standing position of knees (FD, varus/valgus) and hips (FD, externally rotated)
- Using plumb line, posture grid and photographs can increase accuracy
- It is also helpful to assess dynamic posture during different functional movements and positions

Resource**Physiotutors - Posture****Knee effusion**

- Assess and report knee effusion, at a minimum of 2 consistent points in relation to the patella, using a standardized approach (e.g., flexible tape measure)
- Measure girth bilaterally to permit comparison and use of recovery trajectories (Lloyd 2020)

Resource**Youtube video - How to measure knee swelling at home****Evidence summary**

Delphi panel recommended that a comprehensive physical exam be performed using standardized methods and include at a minimum: bilateral passive and active lower limb ROM, bilateral lower limb strength, gait and use of walking aids, static and dynamic balance, standing posture and lower limb alignment, bilateral lower limb soft tissue flexibility, and surgical knee effusion.

Supporting evidence**ROM**

Acar S, Aljumaa, et al. The intrarater and interrater reliability and validity of universal goniometer, digital inclinometer, and smartphone application measuring range of motion in patients with total knee arthroplasty. *Indian J Orthop*. 2024;58:732-9. PMID: [38812867](#)

Komnik I, Weiss S, et al. Motion analysis of patients after knee arthroplasty during activities of daily living: a systematic review. *Gait Posture*. 2015;41(2):370-7. PMID: [25680471](#)

Mizner AL, Lingard EA, et al. Knee range of motion after total knee arthroplasty: how important is this as an outcome? *J Arthroplasty*. 2003;18(3):286.

Mulholland SJ, Wyss UP. Activities of daily living in non-Western cultures: range of motion requirements for hip and knee joint implants. *Int J Rehabil Res*. 2011;24(3):191-8. PMID: [1560234](#)

Soft tissue flexibility

Bhave A, Marker DR, et al. Functional problems and treatment solutions after total hip and knee joint arthroplasty. *JBJS*. 2005;87(Suppl 2):9-21. PMID: [16326719](#)

Muscle strength

Graber J, Juarez-Colunga E, et al. Development of reference charts for monitoring quadriceps strength with handheld dynamometry after total knee arthroplasty. *Disabil Rehabil*. 2022;44(24):7535-42. PMID: [34751608](#)

Kittelson AJ, Christensen JC, et al. Reliability, responsiveness, and validity of handheld dynamometry for assessing quadriceps strength in total knee arthroplasty. *Disabil Rehabil*. 2021;43(21):3070-7. PMCID: [PMC7483560](#)

Meier W, Mizner RL, et al Total knee arthroplasty: muscle impairments, functional limitations, and recommended rehabilitation approaches. J Orthop Sports Phys Ther. 2008;38(5):246-56. PMID: [18448878](#)

Roxburgh BH, Campbell HA, et al. The absolute and relative reliability of hand-held dynamometry in patients with severe lower-limb osteoarthritis scheduled for total joint replacement surgery. Int J Res Ex Phys. 2021;16(2):81-91. [Link](#)

Schache MD, McClellan JA, et al. Lower limb strength following total knee arthroplasty: a systematic review. Knee. 2014;21:12-20. PMID: [24035477](#)

Gait

Bączkiewicz D, Skiba G, et al. Gait and functional status analysis before and after total knee arthroplasty. Knee. 2018;25(5):888-96. PMID: [29941283](#)

Bohannon RW, Andrews A. Normal walking speed: a descriptive meta-analysis. Physiotherapy 2011;97:182-9.

Butler RJ, Thiele RAR, et al. Unipedal balance is affected by lower extremity joint arthroplasty procedure 1 year following surgery. J Arthroplasty. 2015;30(2):286-9. PMID: [25257235](#)

Fary C, Cholewa J, et al. Stepping beyond counts in recovery of total knee arthroplasty: A prospective study on passively collected gait metrics. Sensors. 2023;23:5588. PMCID: [PMC10305196](#)

Balance

Davut Serkan, Huzmeli I, et al. Does total knee arthroplasty positively affect body static-dynamic balance and fall risk parameters in patients with satisfactory functional scores? Cureus. 2022;14(10):e30207. PMCID: [PMC9557240](#)

Moutzouri M, Gleeson N, et al. The effect of total knee arthroplasty on patients' balance and incidence of falls: a systematic review. Knee Surg Sports Traumatol Arthrosc. 2017;25:3439-51. PMID: [27761627](#)

Schwartz I, Kandel L, et al. Balance is an important predictive factor for quality of life and function after primary total knee replacement. J Bone Joint Surg (Br). 2012;94(6):782-6. PMID: [22628592](#)

Posture and alignment

Kim SC, Choi HG, et al. Effects of total knee arthroplasty on coronal and sagittal whole-body alignments: serial assessments using Whole-Body EOS. J Clin Med. 2021;10(15):3242. PMCID: [PMC8348330](#)

Van Criekinge T, Winnock de Grave PW, et al. Trunk control, motion and alignment after total knee arthroplasty: a systematic review and meta-analysis. Gait Posture. 2022;94:173-88. PMID: [35339965](#)

Effusion

Li KY, FU H, et al. Swelling assessment after total knee arthroplasty. J Orthop Surg. 2022;30(2):10225536221127668. PMID: [36122907](#)

Loyd BJ, Kittelson AJ, et al. Development of a reference chart to monitor postoperative swelling following total knee arthroplasty. Disabil Rehabil. 2020;42(12):1767-74. PMID: [30668214](#)

Survey* says...

- **25%** of clinicians routinely perform all components of the physical exam using standardized methods
- **89%** rated this as **very important** and **84%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

QI-3

Assess and document physical function at start and prior to discharge using a standardized self-report tool

Rationale

Self-reported function is a core recommended outcome to monitor after TKR. After an initial drop in self-reported function, pre-op values are usually achieved within 3 weeks post-op, much sooner than with performance tests. The Canadian Joint Replacement Registry asks all provinces to submit pre- and post-TKR patient-reported outcome measure (PROM) data using the Oxford Knee Score. PROMs contribute to patient-centred care and can evaluate whether the rehabilitation intervention(s) made a difference in the patient's functioning, quality of life or other aspects that are relevant to patients along the recovery pathway.

PROMs are responsive to rehabilitation interventions and there are a number of valid, reliable and feasible tools to use in the post-acute phase after TKR. Self-reported function can improve by as much as 47% in the 1 to 3 month-period after TKA when compared to pre-operative values. The greatest rate of recovery occurs in the first 6-12 weeks.

Using a standardized PROM to assess and document physical function at the start of the rehab program helps to establish patient's baseline status, identify specific limitations to target, and create an individualized treatment program. Reassessing self-reported function prior to discharge allows you to assess treatment effectiveness, provide feedback to the patient on their progress, and have confidence in the information you share with other members of the patient's healthcare team. PROMs can also be used to assess the quality of care and create a benchmark for healthcare services along the continuum of rehabilitation care and across clinical sites.

Appropriate tools

- Oxford Knee Score*
- Knee injury and Osteoarthritis Outcome Score (KOOS) or KOOS-JR*
- Lower Extremity Functional Scale (LEFS)
- WOMAC OA Index*

*Requires permission and/or licensing fee to use



- If a tool doesn't capture what is important to the patient, consider using the Patient Specific Functional Scale
- Review the scores with the patient and help them interpret what the values mean (e.g., MCID, cut points, norms)

Resources

[Total Joint Arthroplasty Outcome Measures \(TJAOM\) website](#)

[Rehabilitation Measures Database](#)

[Physiopedia](#)

[EULAR outcome measures library](#)

[Rehabilitative Care Alliance](#)

[OrthoToolkit](#)

Evidence summary

Delphi panel recommended that assessment of physical function using a standardized self-report tool should be documented at baseline and prior to discharge (at a minimum).

Supporting evidence

Choi JH, Kim BR, et al. Physical performance correlates with self-reported physical function and quality of life in patients at 3 months after total knee arthroplasty. *Ann Geriatr Med Res.* 2020;24(2):99-106. PMID:

[PMC7370793](#)

De Rosis S, Pennucci F, Lungu DA, et al. A continuous PREMs and PROMs observatory for elective hip and knee arthroplasty: study protocol. *BMJ Open.* 2021;11(9):3049826. [Available here](#)

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. *Phys Ther.* 2020;100(9):1603-31. PMID: [PMC7462050](#)

Kennedy DM, Stratford PW, et al. Modeling early recovery of physical function following hip and knee arthroplasty. *BMC Musculoskelet Disord.* 2006;7:100. PMID: [PMC1712335](#)

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Vissers LCM, van Hove RP, et al. Predicting self-reported functional improvement one year after primary total knee arthroplasty using pre- and postoperative patient-reported outcome measures. *Knee.* 2020;27(3):683-9. PMID: [32563423](#)

Survey* says...

- **Only 20%** of clinicians routinely assess function **using a patient reported outcome measure**
- **32%** rated this as **very important** and **38%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

QI-4

Assess and document physical function at start and prior to discharge using a standardized performance-based tool

Rationale

Performance-based tests capture different aspects of physical function than patient-reported outcome measures (PROMs). While PROM values begin to plateau within 6 weeks after surgery, performance-based functioning recovers at a slower rate and continues to improve 12 weeks and longer post-TKR. Performance tests take 6-10 weeks to achieve pre-op values while PROMs reach pre-op scores within 3 weeks. Performance tests are more responsive than self-report measures in the sub-acute phase of recovery. More complex physical functioning such as climbing stairs, kneeling, squatting and moving laterally can remain problematic for more than a year after TKR surgery. Almost 75% of patients with a TKR report difficulty negotiating stairs and average stair-climbing speed is 50% slower than healthy peers.

Using standardized performance-based tests to assess and document physical function at the start of the rehab program helps to establish patient's baseline status, identify specific limitations to target, and create an individualized treatment program. Reassessing function prior to discharge allows you to assess treatment effectiveness, provide feedback to the patient on their progress, and have confidence in the information you share with other members of the patient's healthcare team

Appropriate tools

- 30 sec chair stand test (30s CST) (recommended over 5 sit-to-stand test)
- Walking speed (self-paced or fast-paced) over short distance (e.g., 10 m, 40 m)
- Timed stair climb test
- Timed Up & Go (TUG)
- 6-minute walk test (6MWT)



- Specific limitations identified in a PROM can inform your choice of performance test
- Review the scores with the patient and help them interpret what the values mean (e.g., MCID, cut points, normative values)

Resources

[Total Joint Arthroplasty Outcome Measures \(TJAOM\) website](#)

[Rehabilitation Measures Database](#) (type in name of outcome measure)

[OARSI Physical Performance Measures](#) (+ links to videos)

Evidence summary

Delphi panel recommended that physical functioning be assessed at the start and again before discharge from supervised rehab using one or more standardized performance-based test.

Supporting evidence

Bade MJ, Kohrt WM, et al. Outcomes before and after total knee arthroplasty compared to healthy adults. J Orthop Sports Phys Ther. 2010;40(9):559-67. PMCID: [PMC3164265](#)

Dobson F, Hinman RS, et al. OARSI-recommended performance-based tests to assess physical function in people diagnosed with hip or knee osteoarthritis. Osteoarthritis Cartilage. 2013;21:1042-52. PMID: [23680877](#)

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Mark-Christensen T, Kehlet H. Assessment of functional recovery after total hip and knee arthroplasty: An observational study of 95 patients. Musculoskelet Care. 2019;17(4):300-12. PMID: [31489996](#)

Mizner RL, Petterson SC, et al. Measuring functional improvement after total knee arthroplasty requires both performance-based and patient-report assessments. J Arthroplasty. 2011;26(5):728-37. PMCID: [PMC3008304](#)

Murakami T, Fujiwara M, et al. Comparison of difficulty in stair ascent and descent after total knee replacement. J Phys Ther Sci. 2024;36(4):214-7. PMCID: [PMC10981952](#)

Scott CEH, Holland G, et al. The ability to knee before and after total knee arthroplasty: the role of the pattern of osteoarthritis and the position of the femoral component. Bone Joint J. 2021;103-B(9):1514-25. PMID: [34465156](#)

Stratford PW, Kennedy DM, et al. Quantifying self-report measures' overestimation of mobility scores postarthroplasty. Phys Ther 2010;90:1288-96. PMID: [20592271](#)

Swinkels A, Allain TJ. Physical performance tests, self-reported outcomes, and accidental falls before and after total knee arthroplasty: an exploratory study. Physiother Theory Pract. 2013;29(6):432-42. PMID: [23289963](#)

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Survey* says...

- **36%%** of clinicians routinely assess function **using a standardized performance-based test**
- **45%** rated this as **very important** and **53%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

 QI-5

Assess and document participation (work, leisure, sport, caregiving) using a standardized tool

Updated May 2024

Rationale

Rehabilitation after TKA typically focuses on restoring ROM, strength, mobility and function. However, participation including social participation and return to work and leisure activities, are also important in meeting patients' expectations and achieving satisfaction.

Based on data from the Canadian Joint Replacement Registry 2023 annual report, 34% of individuals undergoing elective TKR surgery are of working age (<65 years old). This proportion will likely increase with higher retirement ages. A majority who were working before surgery are able to return to work within 6 months and up to 85% within 12 months after surgery. Patients with less physically demanding jobs were 3 times more likely to return to work within 6 months of TKR.

Other participation restrictions are reported after TKA including problems with using transportation, shopping, and doing housework 6 months post-op. In the same time frame, 48% of patients had problems participating in recreation and leisure activities. Using the International Classification of Functioning, researchers found concerns with the participation domain became increasingly more important after the first 2 weeks post-op. By 6 weeks, shopping, returning to hobbies, and going back to regular exercise classes or sports were all moderately important to patients.

Using a standardized tool or set of questions to assess and document participation at the start of the supervised rehab program helps to identify the patient's baseline status and goals for return to valued activities, and create an individualized treatment program that addresses impairments and functional limitations contributing to participation restrictions. Reassessing participation prior to discharge allows you to assess treatment effectiveness, provide feedback to the patient on their progress, identify ongoing restrictions, and suggest strategies and resources to help the patient achieve their goals.

Appropriate tools

- Knee injury and Osteoarthritis Outcome Score (KOOS) – Sports and Rec subscale
- Keele Assessment of Participation
- SF-36 Social functioning subscale

Resources

[Total Joint Arthroplasty Outcome Measures \(TJAOM\) website](#)

[Rehabilitation Measures Database](#)

[SF-36 Ortho Toolkit](#)

Evidence summary

Delphi panel recommended that participation including ability to perform care-giving activities, participate in paid/unpaid work and participate in leisure activities should be documented by a member of the healthcare team using a standardized tool because return to work, leisure and sporting activities are important outcomes for patients early in recovery and associated with greater satisfaction.

Supporting evidence

Hylkema TH, Brouwer S, et al. Two-year recovery courses of physical and mental impairments, activity limitations, and participation restrictions after total knee arthroplasty among working-age patients. *Disability and Rehabilitation*. 2022;44(2):291-300. PMID: [32441539](#)

Pisoni C, Giardini A, et al. International Classification of Functioning, Disability and Health (ICF) core sets for osteoarthritis: A useful tool in the follow-up of patients after joint arthroplasty. *Eur J Phys Rehabil Med*. 2008;44:1-9. PMID: [18469736](#)

Sankar A, Davis AM, et al. Return to work and workplace activity limitations following total hip or knee replacement. *Osteoarthritis Cartilage*. 2013;21:1485-93. PMID: [23774473](#)

Tilbury C, Schaasberg W, et al. Return to work after total hip and knee arthroplasty: a systematic review. *Rheumatology*. 2014;53(3):512-25. PMID: [24273048](#)

Witjes S, van Geenen RCI, et al. Expectations of younger patients concerning activities after knee arthroplasty: are we asking the right questions? *Qual Life Res*. 2017;26(2):403–417. PMCID: [PMC5288419](#)

Survey* says...

- **Only 14%** of clinicians routinely assess participation **using a standardized measure**
- **24%** rated this as **very important** and **30%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-6a

Assess and document physical activity and sedentary behaviour using standardized tools

Rationale

Physical activity (PA) after TKR remains well below guideline recommended levels and those of healthy peers. Despite it resulting in decreased joint pain and improved physical function, TKR does not lead to a natural increase in moderate or vigorous PA two years after surgery. The post-acute phase of structured, supervised rehabilitation provides a window of opportunity to screen, support and guide patients on resuming or starting a physically active, health-promoting lifestyle. Prolonged physical inactivity can limit recovery after surgery, increase risk of falls and worsen or lead to other chronic health conditions such as heart disease, diabetes and obesity.

Approximately 50% of individuals meet the PA recommendations of 150 minutes of moderate intensity exercise per week 12 months or more after TKR based on self-report. Using accelerometry data, PA levels were much lower and did not change from pre-operative to 6-months post-op with patients spending 83% of their time engaged in sedentary activities. Patients aged less than 75 years averaged 5000-7000 steps per day 12 and 24 months after TKR while those over 75 years averaged 4000 steps per day. In a large survey of >1,100 patients, 62% participated in sports or were physically active one year prior to surgery and this increased slightly to 71% at 1 year and 72% at 4 years post-op. The most common sports and activities both pre- and post-TKR are recreational walking, cycling, swimming and golf with highest participation levels 5 years prior to surgery and declining levels leading up to surgery. Higher rates of participation in PA and sports are associated with higher levels of satisfaction.

Accelerometers are considered the gold standard for measuring non-specific physical activity; however, being expensive and resource demanding, they are often not feasible in clinical settings. These objective measures also do not necessarily reflect the difficulty of the activities or how important an activity is to a patient.

Establishing previous and expected PA levels after TKR provides important clinical information on which to base PA guidance, establish a patient's readiness to change PA and sedentary behaviour, and set realistic goals and strategies towards achieving health-enhancing PA over the long term.

Appropriate tools

- Physical Activity Vital Sign
- International Physical Activity Questionnaire (IPAQ) - short form
- UCLA Activity Score
- Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH)
- Lower-Extremity Activity Scale (LEAS)

Resources

Exercise is Medicine-PA Vital Sign

EULAR outcome measures library (type in IPAQ, SQUASH or LEAS)

UCLA Activity Score



- With patient consent, use their smart phone or watch to collect valuable data on steps, PA level and sedentary time.
- A simple pedometer can also be very helpful in determining basic PA level.

Evidence summary

Delphi panel recommended that physical activity level and sedentary behaviour be assessed using a standardized tool(s) because patients are less physically active than recommended after TKR and regular physical activity has many health enhancing benefits.

Supporting evidence

Arshi A, Khan IA, et al. Participation in sports and physical activities after total joint arthroplasty. J Arthroplasty. 2023;38(5):806-14.e5. PMID: [36470366](#)

Coenen P, Straat C, et al. Knee arthroplasty: a window of opportunity to improve physical activity in daily life, sports and work. BMJ Open Sport Exerc Med. 2020;6(1):e000822. PMCID: [PMC7312336](#)

Groen JW, Stevens M, et al. After total knee arthroplasty, many people are not active enough to maintain their health and fitness: an observational study. J Physiother. 2012;58(2):113-6. PMID: [22613241](#)

Harding P, Holland AE, et al. Do activity levels increase after total hip and knee arthroplasty? Clin Orthop Relat Res. 2014;472:1502-11. PMCID: [PMC3971219](#)

Konings MJ, De Vroey H, et al. Effect of knee arthroplasty on sports participation and activity levels: a systematic review and meta-analysis. BMJ Open Sport Exerc Med. 2020;6(1):e000729. PMCID: [PMC7312327](#)

Mooiweer Y, van den Akker-Scheek I, et al. Amount and type of physical activity and sports from one year forward after hip or knee arthroplasty-A systematic review. PLoS One. 2021;16(12):e0261784. PMCID: [PMC8714096](#)

Survey* says...

- **Only 20%** of clinicians routinely assess physical activity and sedentary behaviour **using a standardized measure**
- **36%** rated this as **very important** and **36%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-6b

Provide tailored guidance and support to resume an active lifestyle

Rationale

With physical activity (PA) remaining well below recommended levels and those of healthy peers after TKR, it is important to educate patients on the benefits of PA and provide supports and resources to help them achieve an active lifestyle. Patients report a number of barriers to being physically active after TKR including knee pain, limited range of motion, reduced standing and walking tolerance, muscle weakness, and fatigue. Psychological factors include lack of motivation, low mood and fear of falling. Some patients report being unsure of where to start and receiving inconsistent advice from healthcare providers on what activities are safe to do after TKR.

Patients have also identified a number of motivators to being active such as scheduling PA into their day, setting goals, tracking their activity, and being active with a friend/family member. For some, using a wearable device, activity tracker or smartphone App is helpful. Inactive individuals will benefit from just learning the importance of breaking up sedentary time (e.g., standing/walking every 30-60 minutes) and this might be the first move towards being more active.

Discuss the benefits of PA with patients prior to discharge from rehabilitation. Provide PA resources in different formats including evidence-informed websites, print materials, videos and Apps. Work with patients to identify their readiness to be more physically active (stage of change) and select resources with appropriate guidance and behavioural change strategies. Many community and recreation centres offer arthritis-friendly or even joint replacement specific PA programs and exercise classes. The social aspect of such programs can be a strong motivator for some patients.

Resources

Active for Health – [Provider resources](#)

Active for Health – [Patient resources](#)

[Get Moving: Maximizing Your Activity After a Hip or Knee Replacement](#)

[24 hour Movement Guidelines](#)

Evidence summary

Delphi panel recommended that patients be provided tailored guidance and support to resume a physically active lifestyle including:

- Benefits of regular physical activity
- Recommended level of physical activity for health benefits
- Available community-based physical activity or exercise programs appropriate for individuals with TKA
- Helpful online or print resources to support regular physical activity

Supporting evidence

Bakaa N, Chen LH, et al. Understanding barriers and facilitators of exercise adherence after total-knee arthroplasty. *Disabil Rehabil.* 2022;44(21):6348-55. PMID: [34397309](#)

Hawke LJ, Taylor NF, et al. In the dark about physical activity – Exploring patient perceptions of physical activity after elective total joint replacement: A qualitative study. *Arthritis Care Res.* 2022; 74(6):965-974. PMID: [34057314](#)

Pellegrini CA, Ledford G, et al. Understanding barriers and facilitators to healthy eating and physical activity from patients either before and after knee arthroplasty. *Disabil Rehabil.* 2018;40(17):2004-10. PMCID: [PMC5996977](#)

Westby MD, Brittain A, et al. Expert consensus on best practices for post-acute rehabilitation after total hip and knee arthroplasty: A Canada and United States Delphi study. *Arthritis Care Res.* 2014;66(3):411-23. PMID: [24023047](#)

Survey* says...

- **97%** of clinicians routinely provide tailored guidance and support to help patients become more physically active
- **96%** rated this as **very important** and **87%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-7

Assess and document health-related quality of life using a standardized tool

Rationale

Patients rank improvements in pain, function and health-related quality of life (HRQoL) as priority outcomes after TKR. While HRQoL usually improves following surgery, up to 30% of patients are not satisfied with their overall HRQoL and almost half of patients report HRQoL levels below age-matched peers 1 year after TKR. The greatest change in HRQoL occurs in the 3 to 6 month period after TKR; however, some change does occur within the first 6 weeks. In a study from Iceland, the strongest predictor of better physical HRQoL at 6-weeks post-op was patients' reporting difficulty with movement caused them little or very little distress. Rehabilitation programs that include effective pain management, reduce kinesiophobia and identify and discuss patient expectations for recovery are associated with better HRQoL.

Using a standardized tool or set of questions to assess and document HRQoL at the start of the supervised rehab program helps to identify the patient's baseline status and expectations, and create an individualized treatment program that addresses factors contributing to reduced HRQoL. Reassessing HRQoL prior to discharge allows you to assess treatment effectiveness, provide feedback to the patient on their progress, and suggest strategies and resources to help the patient achieve their goals.

Appropriate tools

- Knee injury and Osteoarthritis Outcome Score (KOOS)-QoL subscale
- Short Form-36 (SF-36)
- Osteoarthritis Knee and Hip Quality of Life (OAKHQOL)
- World Health Organization Quality of Life-Brief Version (HOQOL-BREF)
- EuroQoL-5D-5L (EQ-5D-5L)

Resources

[Total Joint Arthroplasty Outcome Measures \(TJAOM\) website](#)

[EULAR outcome measures library](#) (type in name of tool)

[Rehabilitation Measures Database](#) (type in name of tool)

[SF-36 Ortho Toolkit](#)

Evidence summary

Delphi panel recommended that health-related quality of life be assessed and documented using a standardized tool or set of questions because reduced quality of life is a primary reason for having a TKR, and is an important outcome for patients. Better quality of life is associated with greater satisfaction after TKR.

Supporting evidence

Ethgen O, Bruyere O, et al. Health-related quality of life in total hip and knee arthroplasty. J Bone Joint Surg. 2004;86-A(5):963-74. [Link](#)

Kaupilla AM, Kyllönen E, et al. Outcomes of primary total knee arthroplasty: the impact of patient-relevant factors on self-reported function and quality of life. Disabil Rehabil. 2011;33(17):1659-67. PMID: [21184628](#)

Snell D, Siegert L, et al. Evaluating quality of life outcomes following joint replacement: Psychometric evaluation of a short form of the WHOQOL-Bref. Quality of Life Research. 2016;25(1):51-61. PMID: [26068734](#)

Sveinsdóttir H, Kristiansen K, et al. Health related quality of life in patients having total knee replacement and associations with symptoms, recovery, and patient education: A six month follow up study. Int j Orthop Trauma Nurs. 2021;42:100830. PMID: [33518438](#)

Survey* says...

- **Only 3%** of clinicians routinely assess health-related quality of life **using a standardized measure**
- **20%** rated this as **very important** and **21%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-8

Prescribe and document physical therapy and therapeutic exercise that is individualized to patient's needs

Rationale

Evidence-based guidelines and standards of care for primary TKA recommend physiotherapy and exercise interventions aimed at restoring knee ROM, lower extremity muscle strength, mobility, function, balance and physical activity. Evidence and clinical experience have shown that certain rehabilitation parameters are associated with greater effectiveness and treatment adherence, and better patient outcomes and experiences after TKR. While no one approach, treatment format or mode of delivery can be universally recommended, there are key parameters of exercise prescription that are consistent with a physiologic training effect and supported by research evidence.

Parameters**Individualized to patient's needs (goals)**

A Canada-US consensus panel strongly recommended patient-specific needs and preferences be considered when applying rehabilitation best practice recommendations for TKA. UK-based NICE guidelines 2020 recommend that patients who primarily do self-directed rehabilitation with minimal PT contact have clearly established rehabilitation goals, understand the importance of doing the prescribed home exercise program and have a person to contact for advice and support. A one size fits all approach is not recommended.

Supervised

The 2020 APTA guidelines recommend supervised physiotherapy management for all patients who have undergone TKR. Required supervision levels (e.g., 1:1, rehab assistant led, group, telerehab) will vary by patient need, preferences and cognitive status. APTA, Rehabilitation Care Alliance and the Canada-US consensus panel all recommend rehabilitation be provided or supervised by a regulated health care professional with knowledge and clinical experience in arthritis and TJR surgery.

Appropriately dosed

It is helpful to establish a baseline or starting point when prescribing exercises. This will reduce the risk of injury and muscle soreness, ensure an appropriate training threshold and , Contributing to appropriate dose are the principles of specificity, overload, and progression. The proper use of these principles ensures that the loads assigned are sufficient to challenge the involved muscles to become stronger, faster, or more resistant to fatigue. High intensity resistance training based on 8RM (2 sets of 8 reps) was found to be safe and effective compared to low intensity exercise

Regularly progressed

Progression of exercises is necessary to provide a sufficient stimulus to the muscle and evoke a therapeutic training effect. This is most important with resistance, balance and functional training. Regular exercise progression also improves motivation, adherence and enjoyment. The American College of Sports Medicine recommends progressing strengthening exercises by 5-10% (e.g., 20 lbs - to 22 lbs) once a patient can do the same intensity and volume 2 sessions in a row. Rate of perceived exertion (RPE), reps in reserve and momentary muscle fatigue can also be used to guide progression.

Provide clear rationale for when and how to progress and encourage the patient to monitor responses to change in exercise intensity/dosage. Progression strategies can include increase in training frequency, reps/sets, resistance (load), range of motion, body position, speed of movement, and exercise complexity as well as decreased rest intervals between sets.

Monitored for adherence

Exercise adherence reflects the extent to which patients undertake the prescribed program accurately and at the recommended frequency, intensity and duration. Adherence to exercise after TKA is not well studied but has been reported as low as 43 to 56%. Some studies based adherence on attendance at scheduled exercise sessions while other recognized the importance of tracking more detailed information on exercises performed at home to the extent that overall dosage could be determined.

Strategies to increase adherence include using an activity log, exercise journal, activity monitor, App or even recording exercise sessions on a calendar. Tracking efforts can motivate patients to do their prescribed exercise and help physiotherapists determine the effectiveness of the intervention and identify any need for behaviour change strategies.

At least 6 weeks in duration

Increased muscle strength can occur within 2 to 4 weeks of training due to neuromuscular and connective tissue adaptations. Changes in muscle mass occur more gradually over 6 to 12 weeks of training. There was an increasing trend in better 6MWT and TUG times when training increased from 7 to 12 weeks. A majority of strength training interventions included in recent systematic reviews were 6 weeks in duration. Recognizing that not all patients have access to longer periods of supervised rehabilitation, the Delphi panel reached consensus on a minimum of 6 weeks while acknowledging longer term supervised strength training will have additional benefits.

Resources

[Rehab Care Alliance Quick Reference Guide](#)

Evidence summary

Delphi panel recommended physiotherapy interventions including therapeutic exercise that is individualized to the patient's functional needs, supervised, appropriately dosed, regularly progressed, at least 6 weeks in duration and monitored for adherence in order to optimize patient recovery after TKA.

Supporting evidence

Individualized

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Westby MD, Brittain A, et al. Expert consensus on best practices for post-acute rehabilitation after total hip and knee arthroplasty: A Canada and United States Delphi study. Arthritis Care Res. 2014;66(3):411-23. PMID: [24023047](#)

Supervised

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Westby MD, Brittain A, et al. Expert consensus on best practices for post-acute rehabilitation after total hip and knee arthroplasty: A Canada and United States Delphi study. Arthritis Care Res. 2014;66(3):411-23. PMID: [24023047](#)

Dosage

Hughes DC, Ellefsen S, et al. Adaptions to endurance and strength training. Perspectives in Medicine. 2018;8:a029769 [Link](#)

ACSM's Guidelines for Exercise Testing and Prescription, 1th ed. American College of Sports Medicine, 2021. Liguori G (ed): Wolters Kluwer, Netherlands.

Progression

Ratamess NA, Alvar BA, et al. Progression models in resistance training for healthy adults. Med Sci Sports Exerc. 2009;41(3):687-708. PMID: [19204579](#)

Duration

Skoffer B, Dalgas U, et al. Progressive resistance training before and after total hip and knee arthroplasty: a systematic review. Clinical Rehabil. 2015;29(1):14-29. PMID: [24994766](#)

Wang J, Zhu R, et al. Effects of strength training on functional ambulation following knee replacement: a systematic review, meta-analysis, and meta-regression. Sci Rep. 2023;13(1):10728. PMCID: [PMC10317962](#)

Adherence

Bakka N, Chen LH, et al. Reporting of post-operative rehabilitation interventions for total knee arthroplasty: a scoping review. BMC Musculoskelet Disord. 2021;22(1):602. PMCID: [PMC8247251](#)

Survey* says...

- Between **48 and 99%** of clinicians routinely include the various parameters when prescribing a comprehensive exercise program
- **81%** rated the prescription parameters as **very important** and between **64%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-9

Provide a comprehensive therapeutic rehabilitation program

Rationale

Many MSK impairments and activity limitations that develop over the progressive course of knee osteoarthritis are not resolved by TKR surgery. Further, the surgery itself causes significant soft tissue trauma, intense pain, joint effusion, neuromuscular inhibition, altered gait and proprioception, and increased fall risk. Muscle atrophy and activation deficits contribute to chronic strength impairments which in turn has the potential to limit the long-term functional outcomes after TKA. Rehabilitation, primarily through a therapeutic exercise program, is strongly recommended. While no one approach, set of exercises, mode of delivery or therapeutic dosage has been identified, there are key components that are recommended and supported by research evidence.

Evidence-based guidelines and standards of care for primary TKA recommend interventions aimed at reducing surgical knee pain, and restoring knee ROM, lower extremity muscle strength, mobility, function, balance and physical activity. Most patients will benefit from performing exercises in both legs as contralateral knee OA is common and less quadriceps strength in the non-operated limb is associated with poorer outcomes 1 and 2 years after TKA.

Components**Pain management**

The 2020 APTA guidelines recommend patients be taught and encouraged to use cryotherapy for early postoperative pain management in the form of standard cold packs or a cryotherapy device as both have similar benefits and few adverse events. Recent systematic reviews found small, short term and inconsistent benefits of cryotherapy vs. no cold application for pain and edema post-TKA. Temperatures between 10-15° C and application for 10-20 minutes are recommended. Other non-pharmacological pain management strategies with weak and inconsistent evidence include providing guidance on sleeping positions, massage (effleurage) to promote circulation and lymphatic drainage, use of TENS over areas with sufficient sensation, bracing, and cognitive strategies such as deep breathing, imagery, distraction and music. Electrotherapy and acupuncture are also associated with small decreases in pain and reduced opioid consumption after TKR.

Resource

[Pain BC](#)

Active ROM

The 2020 APTA guidelines recommend passive, active assistive, and active ROM exercises for the involved knee following TKA. A Canada-US consensus panel also recommended active and passive ROM as well as stretching exercises to address reduced flexibility in muscles that cross the joint (e.g., hamstrings, rectus femoris). ROM exercises for the hip and ankle may also be helpful if found to be restricted at baseline assessment.

Resource

[Exercise Guide for Knee Replacement Surgery](#)

Progressive resistance training for lower limb muscles

The 2020 APTA guidelines recommend high-intensity strength training during the early post-acute period to improve function and strength. High-intensity training includes loads at 6-8RM and often to the point of momentary muscle fatigue. A resistance training program should include all forms including strength, endurance and power. Power decreases at a greater rate than strength over a patient's lifespan and is needed for balance and fall prevention. Resistance can be in the form of body weight, elastic bands, cuff and free weights, machines or pulley systems. Include forms of resistance that are well tolerated and can be continued at home to make transitioning to independent exercise easier upon completion of supervised rehabilitation.

Resource

[Exercise Guide for Knee Replacement Surgery](#)

[NEMEX-TJR training program](#)

Balance training

The 2020 APTA guidelines recommend motor function training (e.g., balance, walking, movement symmetry). Balance interventions improve walking function as measured by gait speed, stair-climbing time, TUG test and balance-specific performance measures immediately and 6 months after training. Better self-reported function, improved reaching and single-leg standing are also reported. Few studies have looked at the effect of balance training on rate of falls in the year after TKA and results are mixed.

Static balance activities may include single leg stance, adding arm movements and head turning, tandem standing, forward/sideways reaching out of the base of support and resisting perturbations. Dynamic balance training includes tandem walking, side stepping, stepping in different directions, stepping over objects, using an agility ladder, turning, and completing an obstacle course. Dual task training offers an added challenge to all of these balance activities.

Resources

[Exercise Guide for Knee Replacement Surgery](#)

[NHS Balance exercises](#)

[Finding Balance BC](#)

Postural and core stability training

Pain, inactivity, decreased proprioception, altered gait patterns, and proximal lower limb muscle weakness can all contribute to poor posture and impaired activation of core muscles (e.g., transversus abdominus, lower gluts, pelvic floor). Low intensity, repetitive exercises that activate these key muscles will lead to better trunk stabilization and reduced risk of back strain. Exercises might include simple activation of these muscles in different lying, sitting

and standing positions or progression to Sahrman's exercises such as leg slide, bent knee fall out and single leg raise. Pilates-based approaches can be very helpful in localizing these muscles and improving balance. A Canada-US consensus panel recommended postural training after TKA.

Resources

[Exercise Guide for Knee Replacement Surgery](#)

[Sahrman core exercise progressions](#) (May not be accessible through Health Authority server)

[NEMEX-TJR training program](#)

Gait training

The 2020 APTA guidelines recommend motor function training (e.g., balance, walking, movement symmetry). A Canada-US consensus panel recommended gait training include: correct use/progression of walking aids; correction of altered gait pattern; indoor/outdoor training; and variable surface training. It is also helpful to train patients at different walking speeds and on different slopes to mimic what they might encounter in the real world.

Resource

[Exercise Guide for Knee Replacement Surgery](#)

Functional exercises

Patients experience greater improvement in self-reported and performance-based measures of function when rehabilitation programs include functional training. Identifying specific activity limitations at baseline can guide the functional training such as breaking down the movements needed to lower to and rise from the floor. Difficulty rising from a standard chair can be addressed through progressively lower chair heights, staggered foot position and addition of loads (e.g., holding free weights). Additional functional exercises valued by patients after TKR include stair ascent/descent, squatting, kneeling and picking up a load from the floor.

Resource

[Exercise Guide for Knee Replacement Surgery](#)

[NEMEX-TJR training program](#)

Home exercise program

Supervised rehabilitation is time-limited and cannot fully address or optimize all aspects of patient functioning after TKA. Patients are encouraged to continue with a home exercise program for as long as a year after surgery. Implementing the home program while the patient is actively participating in supervised rehabilitation, allows for guidance on exercise technique, modifications and progressions. Home exercises are also important in supplementing the once or twice/week supervised sessions and ensuring sufficient exercise dosage to improve strength and function. A home program should be accompanied by printed exercises sheets (ideally with illustrations), videos, web or App-based exercises with instructions on frequency, intensity, reps/sets, and how/when to progress or regress exercises. An exercise log or tracker will help the patient track their exercise adherence and progress.

Resource

[Exercise Guide for Knee Replacement Surgery](#)

Evidence summary

Delphi panel recommended pain management strategies, active knee range of motion exercise, progressive resistance training for bilateral lower limb muscles, static and dynamic balance training, postural and core stability training, gait training, functional exercises, provision of a home exercise program with guidance on how to progress exercises.

Supporting evidence

Pain management

Aggarwal A, Adie S, et al. Cryotherapy following total knee replacement. Cochrane Database Syst Rev. 2023;9(9):CD007911. PMID: [37706609](#)

Derogatis MJ, Sodhi N, et al. Pain management strategies to reduce opioid use following total knee arthroplasty. Surg Technol Int. 2019;35:301-10. PMID: [31237342](#)

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Krampe PT, Pereira Bendo AJ, et al. Cryotherapy in knee arthroplasty: Systematic review and meta-analysis. Ther Hypothermia Temp Manag. 2023;13(2):45-54. PMID: [36472555](#)

Lee Y, Shin YS, et al. Effectiveness and methods of cryotherapy in reducing swelling after total knee arthroplasty: A systematic review on randomized controlled trials. Nurs Open. 2023;10(9):5989-98. PMCID: [PMC10415999](#)

Liu MM, Tian M, et al. Continuous cryotherapy vs. traditional cryotherapy after total knee arthroplasty: A systematic review and meta-analysis of randomized controlled trials. Front Surg. 2023;9:1073288. PMCID: [9874230](#)

Tedesco D, Gori D, et al. Drug-free interventions to reduce pain or opioid consumption after total knee arthroplasty: a systematic review and meta-analysis. JAMA Surg. 2017;152(10):e172872. PMCID: [PMC5831469](#)

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Whale K, Wylde V, et al. Effectiveness and reporting standards of psychological interventions for improving short-term and long-term pain outcomes after total knee replacement: a systematic review. BMJ Open. 2019;9(12): e029742. [Link](#)

Range of motion

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Total Joint Replacement Quick Reference Guides. Rehabilitative Care Alliance. October 2022. [Link](#)

Strength training

Husby VS, Foss OA, et al. Randomized controlled trial of maximal strength training vs. standard rehabilitation following total knee arthroplasty. Eur J Phys Rehabil Med. 2018;54(3):371-9. PMID: [28901118](#)

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Liu H, Cong H, et al. Efficacy and safety of lower limb progressive resistance exercise for patients with total knee arthroplasty: a meta-analysis of randomized controlled trials. Arch Phys Med Rehabil. 2021;102(3):488-501. PMID: [32569586](#)

Peter WF, Nelisse RGHH, et al. Guideline recommendations for post-acute postoperative physiotherapy in total hip and knee arthroplasty: are they used in daily clinical practice? Musculoskelet. Care. 2014;12:125–31. PMID: [24497426](#)

Skoffler B, Dalgas U, et al. Progressive resistance training before and after total hip and knee arthroplasty: a systematic review. Clin Rehabil. 2015;29(1):14-29. PMID: [24994766](#)

Zeni JA, Snyder-Mackler L. Early postoperative measures predict 1- and 2-year outcomes after unilateral total knee arthroplasty: Importance of contralateral limb strength. Phys Ther. 2010;90(1):43-54. PMCID: [PMC2802824](#)

Balance

Doma K, Grant A, et al. The effects of balance training on balance performance and functional outcome measures following total knee arthroplasty: a systematic review and meta-analysis. Sports Med. 2018;48(10):2367-85. PMID: [30117054](#)

Core stability

Karaman A, Yuksel I, et al. Do Pilates-based exercises following total knee arthroplasty improve postural control and quality of life? Physiother Theory Pract. 2017;33(4):289-95. PMID: [28443790](#)

Sahrmann S. Diagnosis and Treatment of Movement Impairment Syndromes. 1st edition. St. Louis, MO: Mosby; 2001.

Gait

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Function

Jette DU, Hunter SJ, et al. Physical therapist management of total knee arthroplasty. Phys Ther. 2020;100(9):1603-31. PMCID: [PMC7462050](#)

Peter WF, Nelisse RGHH, et al. Guideline recommendations for post-acute postoperative physiotherapy in total hip and knee arthroplasty: are they used in daily clinical practice? Musculoskelet. Care. 2014;12:125–31. PMID: [24497426](#)

Survey* says...

- Between **63 and 100%** of clinicians routinely include the various components when prescribing a comprehensive exercise program
- Between **70 and 99%** of the components were rated as **very important** and between **70 and 96%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024

 QI-10**Assess and document patient's experience and satisfaction with rehabilitation****Rationale**

Patient reported experience measures (PREMS) gather information on patients' actual experience while receiving care. They are an indicator of the quality of patient care, although do not measure it directly. PREMs do not look at the outcomes of care but the impact of the process of the care on the patient's experience. Aspects of care including shared decision making, communication among providers, and patient-provider relationships are associated with higher overall care ratings. PREMS differ from satisfaction by reporting objective patient experiences, removing the ability to report subjective views. Patients can be highly satisfied with the outcomes of TKR surgery and rehabilitation independent of their care experience and vice versa. Greater positive patient experience is associated with higher levels of patient safety and clinical effectiveness across a range of health conditions. Assessment of patient experience with rehabilitation and satisfaction with outcomes provides a way to evaluate the many facets of rehabilitation care and identify areas for improvement.

Collect patient experience and satisfaction data soon after completion of rehabilitation to facilitate patient recall. Questionnaires should be completed away from the providers and after discharge from care to avoid affecting the patient-provider relationship. PREMS and satisfaction questionnaires can be distributed via online surveys, Apps, email and text messages.

Resource

No single questionnaire is recommended. Programs and clinics should create their own set of questions specific to their setting and aspects of care they would like to assess. For an example see:

[Health Quality Ontario Patient Experience Survey](#)

Evidence summary

Delphi panel recommended the assessment of patient's experience and satisfaction with the rehabilitation process and outcomes of care using a standardized form or questionnaire such as a program evaluation form or questionnaire emailed after discharge from treatment.

Supporting evidence

De Rosi S, Pennucci F, et al. A continuous PREMs and PROMs observatory for elective hip and knee arthroplasty: study protocol. *BMJ Open*. 2021;11(9):3049826. PMCID: [PMC8458328](#)

Doyle C, Lennox L, et al. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open* 2013;3(1). PMCID: [PMC3549241](#)

Gleeson H, Calderon A, et al. Systematic review of approaches to using patient experience data for quality improvement in healthcare settings. *BMJ Open* 2016;6:e011907. PMCID: [PMC5013495](#)

Kingsley C, Patel S. Patient-reported outcome measures and patient-reported experience measures. *BJA Education*. 2017;17(4):137-44. [Link](#)

Rossettini G, Latini TM, et al. Determinants of patient satisfaction in outpatient musculoskeletal physiotherapy: a systematic qualitative meta-summary, and meta-synthesis. *Disabil Rehabil*. 2020;42(4):460-72. PMID: [30428722](#)

Wang MC, Chan PH, et al. Factors influencing patient satisfaction with care and surgical outcomes for total hip and knee replacement. *Perm J*. 2021;25:21.043. PMCID: [PMC8784075](#)

Survey* says...

- **Only 12%** of clinicians routinely assess patient's experience and satisfaction with rehabilitation using a standardized measure
- **34%** rated this as **very important** and **32%** as **very feasible**

*2018 Canada-wide survey of 238 TJR rehabilitation providers

Updated May 2024