

Prehabilitation and Rehabilitation for Major Joint Replacement

Evidence Summary



Main Points

- **Prehabilitation for Total Knee Arthroplasty**
 - Compared with no prehabilitation, prehabilitation prior to total knee arthroplasty (TKA), may reduce length of hospital stays and increase in strength but may lead to comparable outcomes of pain, range of motion, and activities of daily living (ADL) after TKA (low strength of evidence [SoE] for all).
 - Prehabilitation prior to TKA may not increase the risk of harms (low SoE).
 - There is insufficient evidence regarding the impact of prehabilitation on quality of life (QoL) or need for postoperative procedures.
 - There is no evidence on patient's satisfaction with care after prehabilitation or the impact of prehabilitation on posthospital disposition.
- **Rehabilitation for Total Knee Arthroplasty**
 - Compared with various controls (usually less intensive active rehabilitation), rehabilitation in the acute phase after TKA (initiated within 2 weeks of surgery) may result in increased strength (low SoE) and similar satisfaction with care (low SoE), whereas rehabilitation delivered in the post-acute phase may result in comparable strength (low SoE). Rehabilitation in the acute and post-acute phase after TKA may result in comparable pain, range of motion (ROM), and ADL (low SoE). Additionally, rehabilitation in the post-acute phase after TKA may result in comparable QoL.
 - There is insufficient evidence on the impact on QoL (for acute rehabilitation), satisfaction with care (for post-acute rehabilitation), and the need for postoperative procedures (both acute and post-acute rehabilitation).

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- **Rehabilitation for Total Knee Arthroplasty (continued)**
 - No studies addressed the risk of harms due to rehabilitation delivered in the acute phase after TKA. Compared with various controls, there was no evidence of an increased risk of harms due to more active rehabilitation delivered in the post-acute phase (low SoE).
- **Prehabilitation for Total Hip Arthroplasty**
 - There is insufficient evidence on the impact of prehabilitation prior to total hip arthroplasty (THA) on pain, strength, ADL, QoL, length of stay, or posthospital disposition.
 - No studies compared prehabilitation to no rehabilitation on satisfaction with care or risk of harms due to prehabilitation.
- **Rehabilitation for Total Hip Arthroplasty**
 - Compared with various controls, rehabilitation in the acute and post-acute phase after THA may result in comparable pain, strength, QoL, and ADL (low SoE).
 - There is insufficient evidence regarding the impact of rehabilitation on satisfaction with care or ROM.
 - Compared with various less active rehabilitation controls or no rehabilitation, rehabilitation following THA may not lead to increased risk of harms (low SoE).
- **All Evidence**
 - There is insufficient evidence regarding which patients may most benefit from (p)rehabilitation for TKA or THA.
 - There is insufficient evidence on the effectiveness of specific (p)rehabilitation intervention components at the level of goals (e.g., strength, flexibility) or the presence of specific exercise components to address these goals for TKA or THA.
 - There is insufficient evidence regarding comparisons of different providers of (p)rehabilitation for TKA or THA.
 - There is insufficient evidence regarding comparisons of different settings of (p)rehabilitation for TKA THA.



Background and Purpose

Total joint replacement, which includes total knee arthroplasty and total hip arthroplasty, is one of the most successful therapies to manage pain and dysfunction of the hip and knee joints for end-stage osteoarthritis. As the prevalence of osteoarthritis has increased, the numbers of TKAs and THAs have increased and are now the most common inpatient surgical procedures covered by Medicare. Patients may be offered rehabilitation prior to surgery (i.e., “prehabilitation”) or after surgery, with the goal of optimizing postoperative function, reducing pain, and returning to normal ADL. The topic of prehabilitation and rehabilitation (hereafter “(p)rehabilitation”) is of interest to health systems to enable evidence-based decision making regarding which interventions should be offered to adults undergoing TKA or THA for osteoarthritis to achieve best clinical outcomes, reduce avoidable complications or joint failures, and be cost- and resource-effective for the health system, patients, and their caregivers.

This systematic review (SR) aims to inform healthcare systems, guideline developers, orthopedic surgeons, physical therapists and other rehabilitation professionals and providers of care for patients who have undergone (or will undergo) TKA or THA for osteoarthritis about (p)rehabilitation options. The SR addresses four Key Questions (KQs): (1) prehabilitation for TKA, (2) rehabilitation for TKA (3) prehabilitation for THA, (4) and rehabilitation for THA.



Methods

We used methods consistent with Agency for Healthcare Research and Quality Evidence-based Practice Center Program Methods Guidance (<https://effectivehealthcare.ahrq.gov/topics/ceer-methods-guide/overview>). The protocol was developed with input from stakeholders on a Key Informants and a Technical Expert Panel, including Learning Health Systems sponsors. Our searches targeted randomized controlled trials (RCTs) and adequately adjusted nonrandomized comparative studies (NRCSSs) from January 1, 2005, to May 3, 2021. We extracted intervention details into Excel and all other study data into the Systematic Review Data Repository (SRDR). The evidence base was too heterogenous to allow for meta-analysis. We assessed the risk of bias and evaluated the SoE using standard methods. The PROSPERO protocol registration number is CRD42020199102.



Results

We found 83 primary studies comprising 14,533 patients in total. These included 78 RCTs (n=8,397 patients) and 5 adjusted NRCSSs (n= 6,156 patients). Studies were of mostly moderate risk of bias, primarily related to a lack of blinding. The studies were highly heterogeneous. With only two exceptions, studies reported a unique (p)rehabilitation intervention and a wide range of disparate outcomes. The majority of both prehabilitation and rehabilitation interventions included components to increase strength (86% of studies) and flexibility (75%) and, to a lesser extent, components to increase task-specific training (67%) and balance (41%). Studies varied widely in terms of the timing and intensity of the evaluated (p)rehabilitation interventions.

- **Prehabilitation for TKA:** Thirteen RCTs evaluated prehabilitation for TKA. Compared with no prehabilitation, prehabilitation may lead to increased strength and reduced lengths of acute hospital stays following TKA surgery (low SoE). Prehabilitation may result in comparable pain, range of motion, and activities of daily living (low SoE). There is insufficient evidence regarding the impact of prehabilitation on QoL or need for postoperative procedures and no evidence addressing satisfaction with care or posthospital disposition outcomes associated with prehabilitation prior to TKA. Prehabilitation prior to TKA may not increase the risk of harms (low SoE).
- **Comparison of Rehabilitation Interventions for TKA:** Forty-nine RCTs and 4 NRCSSs evaluated various rehabilitation interventions and comparators following

TKA. Various rehabilitation programs in the acute and post-acute phase following TKA may result in comparable improvements in outcomes of pain, ROM, and ADL (low SoE). Acute-phase rehabilitation programs resulted in similar satisfaction with care (low SoE for all). More intensive rehabilitation (e.g., via virtual rehabilitation or with neuromuscular stimulation) may result in increased strength when delivered in the acute phase. More intensive rehabilitation led to similar outcomes of strength among rehabilitation programs delivered in the post-acute phase. There is insufficient evidence on the impact on QoL (for acute rehabilitation), satisfaction with care (for post-acute rehabilitation), and the need for postoperative procedures (both acute and post-acute rehabilitation). We found no evidence regarding harms from acute-phase rehabilitation. Post-acute rehabilitation may have comparable risks of harms among various rehabilitation interventions compared (low SoE).

- **Prehabilitation for THA:** Six RCTs evaluated prehabilitation for THA. There is insufficient evidence for various patient-reported, performance-based, and healthcare-utilization outcomes when comparing prehabilitation to no prehabilitation prior to THA.
- **Comparison of Rehabilitation Interventions for THA:** Fourteen RCTs and one NRCS evaluated rehabilitation for THA. Rehabilitation in the acute and post-acute phase following THA may result in comparable improvements in patients experience of pain and QoL and performance of strength and ADLs (low SoE). There is insufficient evidence for ROM and satisfaction with care. There is no evidence of increased risk of harm from rehabilitation interventions compared with less active rehabilitation or no rehabilitation controls (low SoE).



Limitations

Although we found a large body of mostly RCT evidence, the evidence was ultimately sparse since relatively few studies reported the same outcomes pertaining to similar comparisons. With the exception of two interventions evaluated in two studies each, all studies reported unique (p)rehabilitation interventions. Reporting of intervention content was also highly variable, ranging from a few words (e.g., “inpatient rehabilitation”) to comprehensive (p)rehabilitation protocols. This variability made coding of intervention content challenging. Thus, evidence regarding prehabilitation (compared with no prehabilitation) and rehabilitation interventions (compared with other rehabilitation interventions) is largely insufficient or of low SoE. Very limited subgroup data was reported, precluding most evaluation of heterogeneity of treatment effects (differences in effect across subgroups). The included studies were mostly at moderate to high risk of bias. Several prioritized outcomes, including strength, ROM, satisfaction with care, and QoL, were infrequently reported.



Implications and Conclusions

Our analysis of all prehabilitation and rehabilitation interventions for TKA and THA found no clear evidence of the effectiveness of prehabilitation versus no prehabilitation, or the comparative effectiveness of diverse rehabilitation programs compared with each other. However, there was some evidence of improved outcomes in specific (p)rehabilitation programs, and a strength of this review is its thorough standardized extraction and synthesis of all (p)rehabilitation interventions. In the absence of definitive evidence on which programs to implement, stakeholders may need to rely on other decision-making factors to decide which (p)rehabilitation program to implement or evaluate. Our detailed categorization of the components of (p)rehabilitation interventions and how they were delivered could be used to guide the efforts to better standardize and improve the evidence base. A strategic and coordinated program of research is needed to address the questions related to (p)rehabilitation, specifically to identify which components of interventions work best and under what circumstances (e.g., setting, personnel, or modes of delivery). To improve interpretation and allow for future meta-analyses, researchers (and funders of research) should consider the use of standardized terminology of intervention content and core outcome sets to measure intervention effects, combined with a universal expectation of robust and transparent reporting of both. Future studies should also consider collecting data on the direct and indirect costs of (p)rehabilitation programs and conduct cost-effectiveness analyses alongside effectiveness analyses to contribute a more complete evidentiary picture to inform evidence-based decision-making regarding which interventions should be offered to adults undergoing TKA or THA for osteoarthritis.

Full Report

Suggested citation: Konnyu KJ, Thoma LM, Bhuma MR, Cao W, Adam GP, Mehta S, Aaron RK, Racine-Avila J, Panagiotou OA, Pinto D, Balk EM. Prehabilitation and Rehabilitation for Major Joint Replacement. Comparative Effectiveness Review No. 248. (Prepared by the Brown Evidence-based Practice Center under Contract No. 75Q80120D00001.) AHRQ Publication No. 21(22)-EHC033. Rockville, MD: Agency for Healthcare Research and Quality; November 2021. DOI: [10.23970/AHRQEPCCER248](https://doi.org/10.23970/AHRQEPCCER248). Posted final reports are located on the Effective Health Care Program [search page](#).

