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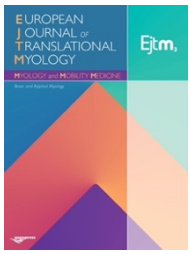

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Early rehabilitation after total hip or knee joint replacement: a narrative review

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Abstract

When conservative treatment of osteoarthritis is not effective, patients may undergo total joint replacement. Postoperative rehabilitation is a crucial component of recovery, and early rehabilitation plays a particularly important role in optimizing outcomes, with the aim of enabling patients to return to independence and work as soon as possible. The aim of this paper is to summarize the role of early rehabilitation after total knee and hip joint replacement, including its main goals, key components, optimal timing, potential risks, and the evidence comparing early with delayed rehabilitation. Current evidence indicates that early inpatient rehabilitation contributes to faster recovery of mobility, improved joint range of motion and muscle strength, fewer postoperative complications, and shorter hospital stays. Early outpatient rehabilitation initiated soon after discharge may further support recovery by increasing daily physical activity, improving joint mobility, and reducing rehabilitation costs. Although some studies report similar clinical outcomes between early and delayed physiotherapy, earlier initiation may allow patients to achieve comparable functional recovery sooner. Overall, early rehabilitation represents a safe and effective approach that should be integrated into standard postoperative care pathways.

Key words: early rehabilitation; total knee arthroplasty; total hip arthroplasty; postoperative rehabilitation; functional recovery

With the increasing proportion of older individuals in the population, a rise in age-related degenerative diseases is also observed.[1] Among musculoskeletal disorders affecting this population, osteoarthritis Osteoarthritis (OA) is one of the most prevalent conditions.[2] Data from Germany indicate that approximately 22% of individuals older than 60 years are diagnosed with knee or hip OA, with prevalence increasing further with advancing age[3]. Individuals with knee or hip OA may experience a variety of symptoms and clinical signs that can substantially affect daily functioning. These commonly include pain, reduced walking ability, and limited joint mobility,[4] as well as joint deformity and swelling,[5] stiffness, and muscle weakness.[6,7] In cases where OA leads to a considerable reduction in quality of life and conservative treatment options are exhausted, patients may be referred for partial or total joint replacement surgery Total Joint Replacement Surgery (TJR). TJR is one of the most commonly performed procedures in orthopedic surgery.[6,7] During this procedure, the weight-bearing surfaces of the joint are replaced with prosthetic implants in order to reduce pain, improve joint function, restore functional independence, correct joint deformity, and enhance patients' quality of life.[4,8]

Rehabilitation following orthopedic surgery represents a core field within Physical and Rehabilitation Medicine (PRM), which focuses on restoring function, minimizing disability, and optimizing participation in daily life. PRM interventions include therapeutic exercise, physical modalities, patient education, and functional training delivered by multidisciplinary rehabilitation teams.[9] To maximize the benefits of TJR, postoperative rehabilitation is essential. Rehabilitation following TJR is commonly divided into an early phase and a later phase. The early rehabilitation phase typically includes both inpatient and outpatient rehabilitation during the first six weeks after surgery,[10] followed by a later phase that usually takes place in an outpatient setting. Appropriate interventions in the early postoperative period are particularly important for enabling patients to regain functional independence as soon as possible and facilitating an earlier return to daily activities and work. In addition, early rehabilitation initiated within the first two postoperative weeks can influence the entire subsequent rehabilitation process and long-term recovery trajectory.[11] Early rehabilitation also plays a key role in reducing the risk of major postoperative

complications, such as deep vein thrombosis Deep Vein Thrombosis (DVT), pulmonary embolism, pneumonia, and cystitis.[12–16] It also shortens the length of hospital stay and reduce overall healthcare costs.[12–16]

The aim of this paper is to summarize the role of early rehabilitation after total knee or hip joint replacement and to outline its key goals, core components, optimal timing, potential adverse effects, and the evidence comparing early with delayed rehabilitation in terms of functional recovery and postoperative complications. By synthesizing current evidence into practical considerations, this paper aims to support clinicians in planning safe, timely, and effective early rehabilitation pathways.

Materials and Methods

This narrative review was based on a structured search of three electronic databases: PubMed, Scopus, and Web of Science. The search was performed in February 2026 by M.O.Z. and Ž.K. and combined terms related to early rehabilitation (e.g., “early rehabilitation,” “early-stage rehabilitation,” “accelerated rehabilitation,” and “early versus late”) with terms referring to total hip and knee arthroplasty. Intervention-related keywords were searched in titles and abstracts, while procedure-related terms were restricted to titles in order to improve relevance while maintaining adequate sensitivity. Only articles published in English were considered.

As this review follows a narrative rather than a systematic approach, no formal inclusion or exclusion criteria or risk-of-bias assessment were applied. Emphasis was placed on recent and methodologically robust publications, particularly systematic reviews, meta-analyses, and randomized controlled trials. When several reviews addressed similar topics, priority was given to those with broader scope, more recent search periods, or larger samples. Narrative reviews and original studies were also included when they provided relevant information not covered by existing reviews. Studies were ultimately selected according to their relevance to the main themes of this review, including the goals, key components, timing, safety considerations, and clinical effects of early rehabilitation after total hip or knee joint replacement.

Goals of early rehabilitation

Early inpatient rehabilitation primarily focuses on pain reduction and shortening the length of hospital stay.[17,18] In addition, important goals include preventing prosthesis dislocation, reducing the risk of pressure ulcers, and preventing thromboembolic complications.[19] Another key objective

is improving joint range of motion, particularly following total knee replacement, as sufficient knee mobility is essential for achieving an optimal gait pattern.[20] Patients after total knee replacement often adopt a so-called quadriceps avoidance gait pattern. Therefore, early rehabilitation aims to eliminate this maladaptive gait strategy, as it may have implications for long-term prosthesis function and survival.[21] In the early phase of rehabilitation, emphasis is also placed on improving quadriceps activation to prevent the development of an extension lag,[22] increasing muscle strength, and reducing postoperative swelling,[23] while also improving neuromuscular activation, motor control, and the ability to voluntarily recruit the quadriceps muscle, which may be compromised due to arthrogenic muscle inhibition (a neural inhibition that prevents the quadriceps from being fully activated).[24] Postoperative swelling may contribute to arthrogenic muscle inhibition, as well as to increased pain and reduced range of motion; therefore, controlling swelling represents an important therapeutic goal.[25] Before discharge from inpatient rehabilitation, patients are typically required to achieve specific functional criteria, although these may vary between institutions. For example, some authors report that patients after total knee replacement should demonstrate adequate pain control, achieve at least 90° of knee flexion, mobilize independently with the aid of crutches, and successfully complete a stair-climbing assessment before hospital discharge.[26] Once the patient is discharged, participation in outpatient rehabilitation is recommended,[27] the aim of which is to continue the process of functional recovery that began in the early postoperative period and to further improve joint mobility, muscle strength, and the ability to perform activities of daily living.

Key components of early rehabilitation

Early postoperative rehabilitation after TJR typically consists of a structured program of progressive exercises and functional training aimed at restoring mobility, muscle function, and independence while preventing postoperative complications. Rehabilitation usually begins within the first postoperative day and is gradually progressed according to the patient's tolerance and clinical condition.[4,28,29]

One of the central components of early rehabilitation is early mobilisation and verticalisation. Patients are usually encouraged to sit upright and stand with assistance shortly after surgery, followed by short-distance ambulation using assistive devices such as walkers or crutches. As rehabilitation progresses, walking distance is gradually increased, and patients are trained in stair negotiation and safe ambulation in different environments.[20,29,30]

Therapeutic exercises are another key component of early rehabilitation. These typically include active or active-assisted range of motion exercises for the operated joint, ankle pumping exercises, and flexion–extension movements of the knee or hip. In some clinical settings, continuous passive motion Continuous Passive Motion (CPM) devices are also used to support early joint mobilisation.[4,31,32] Exercises are commonly performed in different positions, including supine, seated, and standing, and are gradually progressed in intensity and complexity.

Early rehabilitation also focuses on restoring muscle activation and strength, particularly of the quadriceps, hamstrings, and gluteal muscles. Typical exercises include isometric muscle contractions, straight leg raises, hip abduction exercises, and later progressive resistance training to improve lower-limb strength and functional stability.[22,32,33]

In addition to exercise therapy, various supportive physiotherapy interventions may be implemented to reduce pain and swelling and facilitate recovery. These may include cryotherapy, electrotherapy, compression, and other physical therapy modalities.[22,26,34]

Another important component of early rehabilitation is training in functional activities and activities of daily living. Patients are taught safe transfer techniques (e.g., moving in and out of bed, sitting down and standing up), proper use of assistive devices, and strategies for performing everyday tasks independently. The rehabilitation program typically progresses gradually in frequency, duration, and intensity in order to restore functional independence and prepare patients for discharge and further outpatient rehabilitation.[29,30]

The outpatient rehabilitation setting includes various modalities such as individual (one-to-one) physical therapy, group-based physical therapy, home-based exercise interventions, and telerehabilitation. Individual therapy remains widely used in some healthcare systems, while group-based rehabilitation is more commonly implemented in others. Evidence suggests that group-based rehabilitation may provide additional benefits, including greater exercise motivation, structured instruction, and peer support. Furthermore, group-based approaches may represent a cost-effective rehabilitation strategy and have been shown to positively influence physical function in individuals after total knee arthroplasty.[35]

Figure 1 presents the key goals and main components of the early rehabilitation pathway following partial or total knee or hip joint arthroplasty.

When to initiate early rehabilitation

Early postoperative rehabilitation should ideally begin within 24 hours after surgery.[28] The first step typically involves patient mobilisation, which, according to fast-track or Enhanced Recovery After Surgery (ERAS) protocols, should be initiated as soon as possible following the surgical procedure.[36] Early mobilisation has been shown to contribute to a shorter length of hospital stay without increasing the rate of immediate adverse events.[37–43] For example, a Canadian comparative study reported that patients who were mobilised on postoperative day 0 were discharged approximately 69 hours earlier than those who were not mobilised on the first postoperative day.[44] In addition, initiating rehabilitation within the first 24 hours after surgery has been associated with lower healthcare costs, reduced pain, and improved range of motion and muscle strength.[14,45] Most studies report that physiotherapy exercises are initiated on the first postoperative day.[4,20,22,29,32,33] However, some authors suggest that not only mobilisation but also early rehabilitation interventions (including active or active-assisted joint movements) may be initiated already on the day of surgery.[46] After hospital discharge, outpatient early rehabilitation typically begins within 1–2 weeks postoperatively.[20]

Potential risks and safety considerations

Concerns are sometimes raised regarding the safety of early rehabilitation, particularly the potential risk of prosthesis loosening, for example during early weight-bearing after total hip arthroplasty Total Hip Arthroplasty (THA).[47] However, several studies have reported no adverse effects even in patients with uncemented THA who begin full weight-bearing immediately after surgery.[48–50] On the contrary, early rehabilitation may significantly reduce the rate of prosthetic infection, total rehabilitation costs, overall medical expenses, and the number of THA-related outpatient visits during the first postoperative year.[47]

During early rehabilitation, particular attention should be paid to signs such as pain, increased joint swelling, and wound dehiscence.[51] Rehabilitation exercises should also be discontinued if complications such as thrombophlebitis, dislocation of the endoprosthesis, severe pain, or acute circulatory or respiratory failure occur.[30]

Effects of early *vs*. delayed rehabilitation

Several studies report numerous advantages of early compared with delayed inpatient rehabilitation after TJR. For example, Labraca *et al.* (2011)[13] found that initiating rehabilitation within 24 hours after total knee arthroplasty Total Knee Arthroplasty (TKA) reduced hospital length of stay and the number of rehabilitation sessions required for patients to achieve autonomy, as well as normal gait and balance, compared with later initiation of rehabilitation. Early initiation of treatment was also associated with reduced pain and improved range of motion and muscle strength. More recent evidence further supports the benefits of very early exercise initiation. Watabe *et al.* (2024)[51] demonstrated that initiating knee exercises within four hours after TKA, compared with starting rehabilitation seven days after surgery, significantly improved knee joint function. Importantly, this early intervention was shown to be safe, as it did not exacerbate knee swelling or pain and was not associated with an increased incidence of adverse events. Studies also report long-term benefits of early rehabilitation compared with delayed rehabilitation. For example, Kubota *et al.* (2022)[52] found that early initiation of knee extension exercises within four hours after TKA reduced pain, improved range of motion, and was associated with more favourable gait kinematics three weeks after surgery. Furthermore, patients who received early rehabilitation demonstrated better functional outcomes 12 months after surgery compared with those who began rehabilitation on the second postoperative day. In addition, patients in the early rehabilitation group walked with significantly greater knee extension during the stance phase of gait.

Some studies have also reported advantages of early outpatient rehabilitation compared with delayed initiation. Su *et al.* (2015)[47] analysed data from Taiwan's National Health Insurance Research Database and compared patients who initiated outpatient rehabilitation within one week after hospital discharge with those who began rehabilitation later. After propensity-score matching (820 early *vs.* 205 delayed rehabilitation patients), early rehabilitation was associated with substantially lower healthcare utilisation during the first postoperative year, including lower total medical expenses (≈ 70,788 *vs.* 119,293 USD/year) and lower rehabilitation-specific costs (≈ 2,794 *vs*. 10,278 USD/year). Patients in the delayed rehabilitation group also had more outpatient visits (≈ 39 *vs*. 29 per year) and a 3-fold higher risk of prosthetic infection. These findings suggest that earlier initiation of postoperative rehabilitation may reduce both complications and healthcare expenditures following total hip arthroplasty. Earlier initiation of outpatient physical therapy after surgery has also been associated with greater numbers of objectively measured steps and more time spent in an upright position during daily activities.[53] Furthermore, starting outpatient physical therapy earlier (within six weeks after surgery compared with initiation after six weeks) has been

associated with greater improvements in joint range of motion and reduced stiffness, which is particularly important as it may help patients avoid manipulation under anesthesia [27]. In some studies, however, the effectiveness of early rehabilitation compared with delayed rehabilitation appears to depend on the joint that was operated on. For example, a study comparing early versus delayed initiation of aquatic therapy (6 *vs*. 14 days postoperatively) reported different effects following knee and hip arthroplasty. After TKA, early aquatic therapy resulted in clinically meaningful improvements compared with delayed initiation. In contrast, following Total Hip Arthroplasty (THA), outcomes were more favourable in the group that began aquatic therapy later, suggesting that early aquatic therapy may not be optimal after hip arthroplasty.[54] Conversely, a recent meta-analysis reported very low to low quality evidence indicating no significant differences between early and delayed physiotherapy in terms of pain, physical function, or quality of life at short-, medium-, or long-term follow-up.[55] However, it should be noted that these outcomes represent only part of the overall patient recovery profile. They may not fully capture other important aspects, such as total rehabilitation duration, healthcare personnel time, direct and indirect healthcare costs, or absence from work. Importantly, findings showing no major differences between early and delayed outpatient physiotherapy may still support the implementation of early rehabilitation. If comparable clinical outcomes are achieved at the same follow-up time points, early rehabilitation could allow patients to reach similar levels of recovery earlier, enabling a safe and timely return to independence and work while potentially reducing the overall economic burden for both patients and healthcare systems.

The main advantages and potential limitations of early inpatient and early outpatient rehabilitation compared with delayed rehabilitation after total hip or knee joint replacement are summarized in Table 1.

Conclusions

Early rehabilitation represents a fundamental component of postoperative management following total knee or hip joint replacement and can be broadly divided into an early inpatient and an early outpatient phase. Early inpatient rehabilitation, initiated within the first 24 hours after surgery, focuses on early mobilisation, pain management, restoration of joint range of motion, muscle activation, and prevention of postoperative complications. Evidence consistently shows that initiating rehabilitation during this early inpatient period contributes to faster functional recovery, shorter hospital stays, and reduced healthcare costs. Importantly, current evidence indicates that

early mobilisation and physiotherapy interventions are safe when implemented according to appropriate clinical guidelines and patient tolerance. Following hospital discharge, early outpatient rehabilitation plays a key role in continuing the recovery process initiated during the inpatient phase. Outpatient physiotherapy focuses on further improving joint mobility, muscle strength, gait quality, and the ability to perform activities of daily living. Some studies suggest that initiating outpatient rehabilitation soon after discharge may increase daily physical activity, improve joint range of motion, and reduce overall rehabilitation costs, although the magnitude of these benefits may vary depending on the operated joint and the specific rehabilitation modality. Nevertheless, several practical factors may influence participation in outpatient rehabilitation. Some patients experience considerable postoperative pain in the weeks after discharge, which may reduce their willingness or ability to attend physiotherapy sessions. In addition, temporary driving restrictions or limited access to rehabilitation facilities may represent logistical barriers. These considerations highlight the importance of carefully planning rehabilitation pathways and ensuring accessible and well-organized postoperative physiotherapy services.

In summary, early rehabilitation (comprising both early inpatient and early outpatient phases) plays a crucial role in optimizing recovery after total joint replacement. The timely initiation of mobilisation, progressive exercise therapy, and functional training can facilitate faster recovery, support a safe return to independent daily living, and contribute to more efficient use of healthcare resources.

List of Abbreviations

OA, Osteoarthritis

TJR, Total Joint Replacement

TKA, Total Knee Arthroplasty

THA, Total Hip Arthroplasty

DVT, Deep Vein Thrombosis

CPM, Continuous Passive Motion

ERAS, Enhanced Recovery After Surgery

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Contributions

All authors contributed to the conceptualization of the paper. Manca Opara Zupančič and Žiga Kozinc conducted the literature review and prepared the original draft of the manuscript. All authors contributed to the critical revision of the manuscript and approved the final version.

Conflict of interest

The authors declare no potential conflict of interest.

Ethical Publicaiton Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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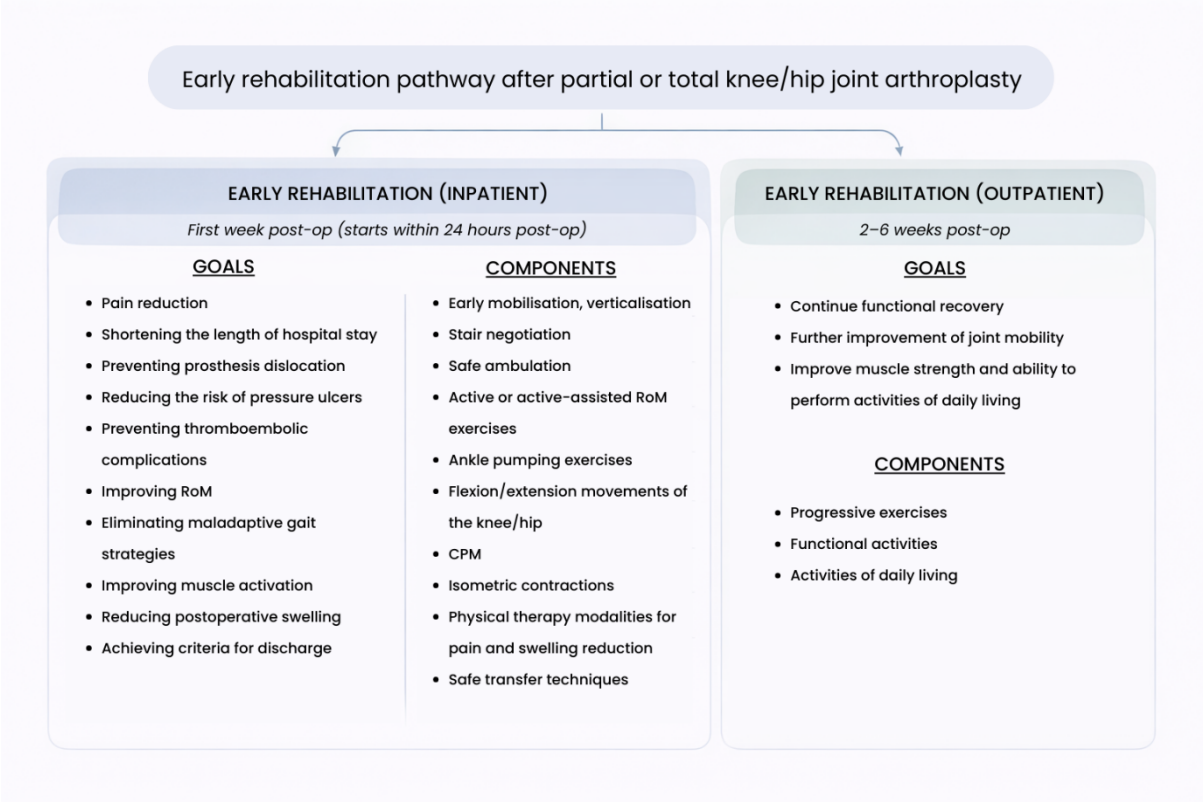

Figure 1. Early rehabilitation pathway after partial or total knee or hip joint arthroplasty.

Table 1. Advantages and limitations of early inpatient and early outpatient rehabilitation compared with delayed rehabilitation after total hip or knee joint replacement.

Rehabilitation phase	Advantages compared with delayed rehabilitation	Potential limitations or challenges
Early inpatient rehabilitation	– Faster functional recovery and restoration of mobility – Improved joint range of motion and muscle strength – Reduced pain – Reduced risk of postoperative complications (e.g., DVT, pulmonary embolism, pneumonia, cystitis) – Shorter hospital length of stay – Lower healthcare costs	– Rehabilitation should be discontinued in case of complications such as thrombophlebitis, prosthesis dislocation, severe pain, or acute circulatory or respiratory failure – Monitoring of symptoms such as increased pain, swelling, or wound problems is required – Some concerns regarding prosthesis loosening with early weight-bearing have been raised, although evidence generally supports safety
Early outpatient rehabilitation	– Continuation of functional recovery initiated during inpatient rehabilitation – Further improvements in joint mobility, muscle strength, gait, and activities of daily living – Increased daily physical activity and time spent in an upright position – Reduced rehabilitation costs and fewer outpatient visits	– Participation may be limited by postoperative pain after discharge – Temporary driving restrictions may create logistical barriers to attending physiotherapy – Evidence comparing early vs. delayed outpatient physiotherapy shows inconsistent results in some studies

	– Reduced stiffness and improved range of motion (may help avoid manipulation under anesthesia)	