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OPTIMIZATION OF REHABILITATION PROTOCOLS AFTER ELECTIVE HIP REPLACEMENT IN LIGHT OF CURRENT SCIENTIFIC EVIDENCE

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ABSTRACT

Introduction: Hip replacement is one of the most effective treatments for advanced degenerative disease, but the optimal postoperative rehabilitation model remains a matter of debate.
Objective: The aim of this study was to evaluate current rehabilitation protocols used after elective hip replacement and identify their most important and best-documented elements.
Methods: A narrative literature review was conducted, encompassing 34 publications from 2015–2025, including randomized controlled trials, systematic reviews, meta-analyses, clinical guidelines, and epidemiological data. PubMed and Google Scholar databases were searched using predefined inclusion and exclusion criteria. The timing of rehabilitation initiation, type of intervention, therapy organization, and their impact on pain and functional outcomes were analyzed.
Main Findings: Available evidence confirms that rehabilitation after elective hip replacement promotes improved function, independence, and pain reduction. Promising results have been reported for early mobilization, resistance exercises, functional training, and multicomponent approaches, including patient education and gait retraining. Early mobilization, often on the day of surgery, can shorten hospitalization, while training programs improve functional outcomes, as assessed by the Harris Hip Score, among other measures. However, no clear advantage of one universal rehabilitation model over others has been demonstrated.
Conclusions: Rehabilitation is a key element of treatment after elective hip replacement, significantly improving function and reducing pain. Current evidence supports early, individually tailored, and comprehensive therapy, including mobilization and targeted strength training. Further high-quality methodological research aimed at standardizing treatment is necessary.

KEYWORDS

Total Hip Arthroplasty; Rehabilitation Protocols; Early Mobilization; Strength Training; Functional Outcomes; Pain; Enhanced Recovery After Surgery (ERAS)

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1. Introduction:

Osteoarthritis (OA) is one of the most common causes of pain, limited mobility, and disability in the adult population, and its clinical and social significance is systematically increasing with aging populations and increasing life expectancy (Perruccio et al., 2024; Christofides et al., 2026). The disease process involves progressive degeneration of joint cartilage, subchondral bone remodeling, and changes in periarticular tissues, leading to pain, limited range of motion, and impaired musculoskeletal function (Perruccio et al., 2024; Orczyk et al., 2021). Consequently, OA significantly reduces the quality of life of patients and generates a growing burden on healthcare systems (Perruccio et al., 2024; Supreme Audit Office, 2019; National Health Fund, 2023).

A specific form of OA is coxarthrosis, or degenerative disease of the hip joint, which is one of the main causes of chronic pain, limited mobility, and loss of independence in adults and the elderly (Lützner et al., 2022; Perruccio et al., 2024). The most important risk factors for its development include age, obesity, biomechanical disorders, overload, and coexisting metabolic and postural disorders (Orczyk et al., 2021; Perruccio et al., 2024). Epidemiological data indicate that degenerative joint disease affects approximately 15–20% of the population in Poland, while coxarthrosis occurs in approximately 8% of people (Orczyk et al., 2021). European data indicate that the prevalence of hip osteoarthritis is approximately 6%, although these values may vary depending on the diagnostic criteria used and the population analyzed (Christofides et al., 2026). Hip osteoarthritis is a significant public health problem both in Poland and Europe, and its incidence increases with age in the studied populations (Christofides et al., 2026; Orczyk et al., 2021). The progressive nature of the disease leads to increasing difficulties with gait, posture, climbing stairs, and performing daily

activities, affecting not only physical activity but also social and occupational functioning of patients (Pop et al., 2018; Perruccio et al., 2024).

Treatment for coxarthrosis includes conservative and surgical procedures. Non-operative management is primarily based on patient education, pharmacotherapy, lifestyle modification, and physiotherapy, including exercises aimed at improving muscle strength, function, and quality of life (Costa et al., 2021; Park & Kim, 2023; Frydendal et al., 2024). In cases of ineffective conservative treatment, severe pain, and significant functional impairment, surgical treatment is considered. Eligibility for surgery should take into account the clinical presentation, the stage of disease progression, imaging findings, and the impact of the disease on the patient's daily functioning (Lützner et al., 2022; National Institute for Health and Care Excellence, 2020). The results of the Frydendal et al. study. (2024) indicate that in patients with severe osteoarthritis and indications for surgery, total hip replacement produces greater improvements in pain and function than resistance training alone, highlighting the importance of proper qualification for the procedure.

Total hip arthroplasty (THA) is currently a recognized and effective treatment for advanced osteoarthritis, reducing pain and improving function and quality of life for patients (Lützner et al., 2022; National Institute for Health and Care Excellence, 2020; Frydendal et al., 2024). As the population ages and indications for surgery expand, the number of procedures performed is steadily increasing, as reflected in both international and national data (Perruccio et al., 2024; National Health Fund, 2023; Supreme Audit Office, 2019). According to data from the National Health Fund, over 59,000 primary hip replacements were performed in Poland in 2022 (National Health Fund, 2023). Despite its high clinical effectiveness, the procedure does not conclude the treatment process, as the full therapeutic effect also depends on the quality of postoperative care, including properly planned rehabilitation (Colibazzi et al., 2020; Konnyu et al., 2023b).

Rehabilitation after THA is a key element of postoperative management and is aimed at reducing pain, improving muscle strength, restoring range of motion, retraining gait, regaining independence, and enabling the return to daily life, social, and—in some cases—occupational activities (Sowa et al., 2019; Park & Kim, 2023; Costa et al., 2021; Pop et al., 2018). The literature emphasizes that appropriate rehabilitation can have a beneficial effect on gait and balance parameters, functional outcomes, and pain levels (Park & Kim, 2023; Beck et al., 2019; Monaghan et al., 2017). Postoperative rehabilitation includes various stages, including an early phase, beginning immediately after surgery, and a late phase, aimed at further improvement of function and return to full activity (Zhu et al., 2017; Costa et al., 2021). These interventions include early mobilization, progressive strength training, functional exercises, gait re-education, self-efficacy interventions, and multi-component programs based on the principles of enhanced recovery after surgery (ERAS) (Zhu et al., 2017; Götz et al., 2024; Meng et al., 2022; Chen et al., 2024). The importance of individualized and stepwise management is also emphasized by clinical protocols developed by specialized centers such as Brigham and Women's Hospital, Massachusetts General Brigham Sports Medicine, and The Ohio State University Wexner Medical Center (Brigham and Women's Hospital, 2022; Massachusetts General Brigham Sports Medicine, 2025; The Ohio State University Wexner Medical Center, 2022).

However, current scientific evidence does not allow for a single universal rehabilitation model to be clearly identified as the best for all patients after elective hip replacement. Systematic reviews indicate significant heterogeneity in the protocols used, with differences in the timing of therapy initiation, exercise intensity, rehabilitation setting, and the selection of outcome measures, which complicates direct comparisons and the formulation of strong recommendations (Konnyu et al., 2023b; Colibazzi et al., 2020; Costa et al., 2021). Similar concerns also apply to prehabilitation: although some studies suggest possible functional benefits in selected patients, the available evidence for THA remains limited or insufficient (Konnyu et al., 2023a; Chen et al., 2024). At the same time, studies comparing different rehabilitation strategies show that more intensive or more complex programs do not always yield significantly better results than simpler, home-based, or standard approaches (Mark-Christensen et al., 2024; Judd et al., 2024; Beck et al., 2019; Naylor et al., 2019).

Nonphysical factors also play a significant role. Treatment outcomes after THA may depend not only on the type of exercise program used but also on the patient's self-efficacy, motivation, commitment, psychological and social factors, and the way the patient functions in their daily life after discharge (Meng et al., 2022; Sergooris et al., 2023; Poulsen et al., 2023). Additionally, some elements of the treatment, such as early mobilization, gait on the day of surgery, or weight-bearing strategies, appear safe and clinically justified in appropriately selected patients; however, their impact on long-term treatment outcomes is still unclear (Temporiti et al., 2020; Huang et al., 2023; Su et al., 2021). It is also worth noting that some of the available publications focus on the population following hip arthroplasty for hip fractures, rather than elective THA for

coxarthrosis, which limits the ability to directly extrapolate all results to the population covered in this study (Mohanan et al., 2025).

Consequently, despite the widespread use of rehabilitation after THA and numerous publications on this topic, there is still no complete consensus on the optimal timing, intensity, location, or set of therapeutic interventions. This gap is of both scientific and practical importance, as it hinders the standardization of care, comparison of treatment outcomes, and implementation of evidence-based recommendations (Naylor et al., 2019; Konnyu et al., 2023b; Colibazzi et al., 2020).

The aim of this study was to evaluate and compare current rehabilitation protocols used after elective hip replacement and to identify their most important and best-documented elements in light of current scientific evidence. Based on this, the research question was formulated: which elements of rehabilitation protocols used after elective hip replacement are most important for improving function and reducing pain in patients?

2. Methods

This paper is a narrative literature review based on an analysis of current scientific reports on rehabilitation protocols used after elective hip replacement. The aim of the review was to compare available rehabilitation models and identify their most important and best-documented elements in improving function and reducing pain in patients after the procedure.

A literature search was conducted using databases such as PubMed and Google Scholar from January to March 2026. Keyword search terms in English and Polish related to hip arthroplasty, rehabilitation, and treatment outcomes included: "hip arthroplasty," "total hip arthroplasty," "total hip replacement," "rehabilitation," "physiotherapy," "early mobilization," "strength training," "functional outcomes," "pain," as well as "hip arthroplasty," "rehabilitation," "physiotherapy," "early mobilization," "strength training," "pain," and "functional outcomes." Search terms were combined using the logical operators AND and OR.

Scientific sources published between 2015 and 2025, available in full text, were eligible for analysis. Randomized controlled trials, original studies, systematic reviews, meta-analyses, clinical guidelines, consensus documents, and selected epidemiological data and clinical management protocols were included if they provided significant information regarding the organization or content of rehabilitation programs. Interpretive priority was given to publications representing a higher level of scientific credibility, particularly randomized controlled trials, systematic reviews, meta-analyses, and clinical guidelines.

The review included publications assessing the impact of various rehabilitation strategies on functional outcomes, pain levels, gait quality, muscle strength, range of motion, patient independence, and postoperative care. Case reports, purely descriptive publications, articles that did not meet the thematic criteria, articles unavailable in full text, and studies referring to other clinical populations were excluded if their results could not be reasonably extrapolated to patients after elective hip replacement. For some publications involving mixed populations or concerning arthroplasty for indications other than coxarthrosis, the data were interpreted cautiously and considered only as supporting evidence.

The publication selection process was qualitative and involved analyzing titles, abstracts, and full texts for relevance to the study's purpose. Ultimately, 34 scientific sources and supporting documents were included in the study, deemed most relevant to the research question.

The collected publications were subjected to qualitative and comparative analysis. Specifically, the timing of rehabilitation initiation, location, type of interventions used, complexity of the therapeutic program, and their impact on improving function and reducing pain were assessed. The importance of selected treatment elements, such as early mobilization, strength training, functional exercises, gait retraining, patient education, post-rehabilitation, and programs based on enhanced recovery after surgery, was also analyzed. The results of individual studies were summarized to identify recurring associations, differences between protocols, and areas where the available evidence remains equivocal.

Due to the narrative nature of the review, a formal, standardized assessment of the methodological quality of all included studies was not conducted. However, the interpretation of the results took into account the type of publication, the nature of the study, and potential limitations resulting from the heterogeneity of the analyzed interventions, populations, and endpoints.

The conducted analysis enabled a synthetic presentation of the current state of knowledge and the formulation of conclusions regarding the optimization of rehabilitation after elective hip replacement in the light of available scientific evidence.

3. Results

Impact of rehabilitation on functionality

Rehabilitation after elective hip replacement is a crucial part of the treatment process, improving patient functionality, including muscle strength, range of motion, gait quality, and the ability to perform daily activities. Available evidence indicates significant improvements in these parameters in most of the analyzed studies, which translates into increased independence and quality of life for patients (Park & Kim, 2023; Costa et al., 2021; Konnyu et al., 2023b).

Some studies indicate the beneficial effects of programs incorporating progressive strength training and functional exercises on muscle strength, balance, and gait parameters (Mark-Christensen et al., 2024; Judd et al., 2024; Beck et al., 2019). Randomized trials have also observed improvements in functional outcomes assessed using standardized tools such as the Harris Hip Score (Mark-Christensen et al., 2024; Judd et al., 2024). However, results are not entirely consistent, and the superiority of specific programs over other forms of rehabilitation has not been clearly confirmed across studies.

Similar observations have been reported in studies combining pre- and postoperative training, suggesting the possibility of additional benefits in terms of patient function and performance. However, the available evidence remains limited and inconclusive (Chen et al., 2024; Konnyu et al., 2023a).

A significant factor differentiating the effects of rehabilitation is the timing of its initiation. Early mobilization, implemented within the first few postoperative days, is consistently associated with faster functional recovery and shorter hospitalization, but its impact on long-term treatment outcomes remains less clear (Zhu et al., 2017; Temporiti et al., 2020).

The importance of a comprehensive therapeutic approach, including patient education and increasing patient engagement in the rehabilitation process, is also emphasized (Meng et al., 2022; Brandes et al., 2018; Poulsen et al., 2023). Individual factors such as age, preoperative condition, and comorbidities significantly modify the achieved outcomes, indicating the need for individualized management (Sergooris et al., 2023; Konnyu et al., 2023a; Meng et al., 2022).

In summary, available data indicate that rehabilitation after elective hip replacement promotes improved patient functionality. The most promising results are related to programs involving early mobilization, resistance exercises and a functional approach, but there is no clear evidence to indicate one optimal rehabilitation model.

The impact of rehabilitation on pain reduction

An important goal of rehabilitation after elective hip replacement is to reduce pain, which is one of the main problems in the postoperative period. Most of the reviewed studies indicate a significant reduction in pain intensity during a properly planned rehabilitation process (Park & Kim, 2023; Costa et al., 2021; Konnyu et al., 2023b).

The pain reduction observed during rehabilitation is associated with functional improvement and a gradual increase in patients' physical activity. Some randomized studies have shown that strength training programs can contribute to pain reduction, but the results are not entirely conclusive (Mark-Christensen et al., 2024; Judd et al., 2024; Beck et al., 2019).

Similar effects have been observed with comprehensive rehabilitation programs that combine physical exercise with patient education and activity support (Meng et al., 2022; Brandes et al., 2018). Multicomponent approaches have been shown to have a beneficial impact on both pain levels and patient functioning, although it is difficult to determine which component of the program plays the key role.

The timing of rehabilitation is also a significant factor influencing pain levels. Early mobilization and the implementation of comprehensive postoperative management can reduce symptoms and improve the patient's overall condition (Zhu et al., 2017). The importance of approaches based on the enhanced recovery after surgery (ERAS) model, which lead to pain reduction and accelerated recovery, has also been emphasized (Zhu et al., 2017; Götz et al., 2024; Colibazzi et al., 2020).

Individual factors, such as pain threshold, the patient's mental state, and their involvement in the rehabilitation process, also influence the level of pain experienced (Sergooris et al., 2023; Meng et al., 2022), indicating the need for a holistic approach that considers both physical and psychosocial aspects.

In summary, rehabilitation after elective hip replacement significantly contributes to pain reduction in patients. The greatest effectiveness is demonstrated by programs based on gradual increases in activity, strength training, and a comprehensive therapeutic approach that addresses the individual needs of the patient. Pain reduction is closely linked to improved functionality, as it enables earlier and more effective participation in physical activity (Park & Kim, 2023; Costa et al., 2021). The impact of individual therapy components on pain levels remains varied and not entirely clear.

Comparison of rehabilitation protocols

In clinical practice, various rehabilitation models are used after elective hip replacement, differing in the timing of therapy initiation, exercise intensity, scope of intervention, and organization of the rehabilitation process. Analysis of available studies indicates a lack of clear evidence supporting the superiority of a single universal rehabilitation protocol (Park & Kim, 2023; Zhu et al., 2017; Costa et al., 2021; Colibazzi et al., 2020).

The best-documented benefits relate to early mobilization, which promotes shorter hospital stays and faster functional recovery (Temporiti et al., 2020; Zhu et al., 2017). The impact of this approach on long-term outcomes remains less clear. However, a more individualized approach may be necessary for patients with additional risk factors (Sergooris et al., 2023; Konnyu et al., 2023a).

Programs based on strength training and functional exercises are among the most commonly used and are often associated with improved functional outcomes. However, available evidence does not clearly support their superiority over other forms of rehabilitation (Mark-Christensen et al., 2024; Judd et al., 2024; Beck et al., 2019).

Another aspect that differentiates protocols is the extent of weight-bearing of the operated limb. Research indicates that early, full weight-bearing can be safe and promotes faster recovery in appropriately selected patients (Huang et al., 2023).

Comprehensive management models, such as enhanced recovery after surgery (ERAS), which integrate early mobilization, optimized pain management, and a multidisciplinary approach, are gaining increasing importance. These approaches are associated with shorter hospital stays and accelerated recovery, but it is difficult to clearly determine which program components have the greatest impact on the achieved outcomes (Zhu et al., 2017; Götz et al., 2024; Colibazzi et al., 2020).

Differences between rehabilitation models also apply to the setting of therapy. Available data indicate that for patients without complications, home-based rehabilitation can be as effective as in-patient rehabilitation, which creates opportunities for optimizing the organization of care (Konnyu et al., 2023a; Poulsen et al., 2023). Furthermore, the choice of rehabilitation setting may depend on clinical and organizational factors, as well as the patient's individual needs (Naylor et al., 2019).

The use of post-rehabilitation constitutes an additional element differentiating therapeutic strategies. Some studies suggest possible benefits in terms of early functional outcomes, but the evidence for patients after elective hip replacement remains limited and inconclusive (Konnyu et al., 2023a; Chen et al., 2024).

In summary, available rehabilitation models vary in many respects, and their effectiveness depends on the methods used, the timing of therapy initiation, and individual patient characteristics. However, there is no clear evidence demonstrating the superiority of a single, universal treatment model.

Key elements of rehabilitation

Analysis of available research allows us to identify key elements of effective rehabilitation protocols (Park & Kim, 2023; Costa et al., 2021). Despite the diversity of models used, it is possible to identify components that have the greatest impact on improving function and reducing pain.

The best-documented components include:

- early mobilization,
- progressive strength training,
- functional exercises and gait re-education,
- patient education,
- and the use of comprehensive models (ERAS).

Multicomponent approaches combining the above elements are widely used and are often associated with improved functional outcomes and pain reduction. However, the available evidence does not allow us to clearly determine which component is crucial for achieving therapeutic effects or whether a specific combination is optimal (Zhu et al., 2017; Costa et al., 2021; Mark-Christensen et al., 2024; Judd et al., 2024).

Similar assumptions are reflected in detailed clinical protocols developed by specialized centers, which define rehabilitation stages, load progression, and exercise ranges in specific postoperative phases (Massachusetts General Brigham Sports Medicine, 2025).

The proposed rehabilitation model is synthetic in nature and based on elements most frequently identified in the literature. However, its application in clinical practice requires further validation in high-quality methodological studies.

4. Discussion

The results of this review indicate that rehabilitation after elective hip replacement is a crucial element of the treatment process, contributing to improved patient functionality and pain reduction. However, analysis of the available evidence does not allow for a clear identification of a single optimal rehabilitation model, due to the significant heterogeneity of the protocols used and the diverse patient populations studied. Consequently, the effectiveness of individual interventions should be considered in the context of individual patient characteristics and the organizational conditions of the healthcare system.

In improving patient functionality, programs involving strength training and functional exercises are particularly important. Randomized trial results suggest that these interventions can lead to improvements in muscle strength, gait parameters, and functional outcomes assessed using standardized tools such as the Harris Hip Score (Mark-Christensen et al., 2024; Judd et al., 2024). At the same time, the available evidence is not fully consistent, and the advantage of more intensive or complex programs over standard forms of rehabilitation has not been unequivocally confirmed, a finding also supported by systematic reviews (Konnyu et al., 2023b; Colibazzi et al., 2020). This may be due to methodological differences between studies, including different inclusion criteria, follow-up times, and outcome measures used.

Similar ambiguity concerns the impact of rehabilitation on pain reduction. Although most studies indicate a reduction in pain intensity during the rehabilitation process, it is difficult to determine which elements of therapy play a key role in this regard (Park & Kim, 2023; Costa et al., 2021). It appears that pain reduction is largely secondary to functional improvement and a gradual increase in patients' physical activity, which emphasizes the importance of a comprehensive therapeutic approach.At the same time, it is important to consider the influence of psychosocial factors, such as the patient's level of self-efficacy, motivation, and mental state, which can significantly modify pain perception and rehabilitation outcomes (Meng et al., 2022; Poulsen et al., 2023).

Early mobilization remains one of the best-documented elements of postoperative management. Implementing patient mobilization within the first few days after surgery is associated with a shorter hospital stay and faster recovery of functional capacity (Zhu et al., 2017; Temporiti et al., 2020). However, its impact on long-term outcomes remains less clear, which may be due to differences in the subsequent rehabilitation process and the level of patient engagement after hospital discharge.

In recent years, increasing importance has been attributed to comprehensive approaches, such as enhanced recovery after surgery (ERAS), which integrate elements of early mobilization, pain management optimization, and multidisciplinary patient care. Available data indicate that implementing such programs can improve early treatment outcomes and shorten hospital stays (Zhu et al., 2017; Götz et al., 2024). At the same time, it is difficult to clearly determine which components of these complex interventions have the greatest impact on the achieved outcomes, which poses a significant limitation in the context of their standardization.

The place where rehabilitation is carried out also remains an important issue. Research suggests that for patients without complications, home-based rehabilitation can be as effective as in-patient rehabilitation (Konnyu et al., 2023a). This suggests the potential for optimizing the organization of care and reducing treatment costs. However, the decision to choose a rehabilitation modality should take into account the patient's clinical condition, functional abilities, and the availability of community support (Naylor et al., 2019).

The use of post-rehabilitation is another area of interest for researchers. Although some studies suggest possible benefits in terms of early functional outcomes, evidence regarding its effectiveness in the context of hip replacement remains limited and inconclusive (Konnyu et al., 2023a; Chen et al., 2024). This indicates the need for further high-quality methodological studies in this area.

Based on the conducted analysis, it can be concluded that the effectiveness of rehabilitation after elective hip replacement is largely dependent on individual patient characteristics, such as age, preoperative functional status, comorbidities, and physical activity level. Therefore, a "one-size-fits-all" approach appears insufficient, and optimization of rehabilitation management should include individualized therapy and flexible adaptation of the program to the patient's needs.

This study has certain limitations that should be considered when interpreting the results. Primarily, it is a narrative literature review, which is due to the lack of a standardized assessment of the methodological quality of the included studies. Furthermore, the analysis included publications of a diverse nature, including randomized controlled trials, systematic reviews, and descriptive studies, which may affect the uniformity of the conclusions. Furthermore, the heterogeneity of the interventions used, patient populations, and endpoints complicates direct comparisons and the formulation of clear recommendations.

Despite these limitations, the obtained results have significant clinical implications. They indicate that rehabilitation should begin as early as possible, include elements of strength and functional training, and incorporate patient education and active involvement in the treatment process. At the same time, it is essential to individually tailor the rehabilitation program to the patient's needs, which can contribute to optimizing treatment outcomes.

Future research with high methodological quality is recommended, particularly randomized controlled trials with long-term follow-up, which will allow for better definition of optimal rehabilitation strategies. It also seems important to strive for standardization of rehabilitation protocols and identify key components of therapy responsible for achieved clinical outcomes.

This paper synthesizes current evidence and organizes key elements of effective rehabilitation protocols, which can support clinical practice. The obtained results are consistent with the growing trend away from rigid protocols and toward individualized approaches.

5. Conclusions

Rehabilitation after elective hip replacement is a key element of the treatment process, significantly improving patient functionality and reducing pain. Available evidence indicates that early implementation of rehabilitation, including mobilization and exercises aimed at improving muscle strength and function, promotes favorable clinical outcomes.

However, there is no clear evidence to identify a single optimal, universal rehabilitation protocol. The effectiveness of individual interventions depends on many factors, including individual patient characteristics, the timing of therapy initiation, the range of methods used, and the organization of the rehabilitation process.

Current evidence indicates that multicomponent approaches, including early mobilization, progressive strength training, functional exercises, and patient education, can promote favorable clinical outcomes. Individualizing rehabilitation and considering psychosocial factors that influence the treatment process are also crucial.

In light of the available evidence, it seems reasonable to use flexible, individualized rehabilitation models tailored to the patient's needs and capabilities, rather than rigidly defined treatment protocols. Further research of high methodological quality is necessary to better define optimal rehabilitation strategies and identify key elements of therapy responsible for the obtained clinical effects.

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REFERENCES

1. Beck, H., Beyer, F., Gering, F., Günther, K. P., Lützner, C., & Walther, A. (2019). Sports therapy interventions following total hip replacement. *Deutsches Ärzteblatt International, 116*(1–2), 1–8. https://doi.org/10.3238/arztebl.2019.0001
2. Brandes, M., Wirsik, N., Niehoff, H., Heimsoth, J., & Möhring, B. (2018). Impact of a tailored activity counselling intervention during inpatient rehabilitation after knee and hip arthroplasty: An explorative RCT. *BMC Musculoskeletal Disorders, 19*, 209. https://doi.org/10.1186/s12891-018-2130-7
3. Brigham and Women's Hospital. (2022). *Total hip arthroplasty/hemiarthroplasty protocol*. https://www.brighamandwomens.org/
4. Chen, G., Yu, D., Wang, Y., Ma, Z., Bi, M., Lu, L., Zhang, X., Li, Y., & Sun, W. (2024). A prospective randomized controlled trial assessing the impact of preoperative combined with postoperative progressive resistance training on muscle strength, gait, balance and function in patients undergoing total hip arthroplasty. *Clinical Interventions in Aging, 19*, 745–760. https://doi.org/10.2147/CIA.S453117
5. Christofides, I., Vavliakis, I., De Klerk, H. H., Broekman, M., Verheyen, C. C., & Doornberg, J. N. (2026). Prevalence of hip and knee osteoarthritis in Europe: A systematic review and meta-analysis. *BMC Musculoskeletal Disorders, 27*(1), 155. https://doi.org/10.1186/s12891-026-09493-7
6. Colibazzi, V., Coladonato, A., Zanazzo, M., & Romanini, E. (2020). Evidence-based rehabilitation after hip arthroplasty. *HIP International, 30*(Suppl. 2), 20–29. https://doi.org/10.1177/1120700020971314
7. Costa, L. dos S. M., Lima, V. G., Barros, F. D. da S. F., Pereira, P. A., Lima, R. M. A., & Silva, A. K. A. da. (2021). Hip arthroplasty: Effective rehabilitation protocols. *Research, Society and Development, 10*(4), e45510414370. https://doi.org/10.33448/rsd-v10i4.14370

8. Frydendal, T., Christensen, R., Mechlenburg, I., Mikkelsen, L. R., Varnum, C., & Graversen, A. E. (2024). Total hip replacement or resistance training for severe hip osteoarthritis. *New England Journal of Medicine, 391*(17), 1610–1620. https://doi.org/10.1056/NEJMoa2400141
9. Götz, J., Maderbacher, G., Leiss, F., Zeman, F., Meyer, M., & Reinhard, J. (2024). Better early outcome with enhanced recovery total hip arthroplasty versus conventional setup: A randomized clinical trial. *Archives of Orthopaedic and Trauma Surgery, 144*(1), 439–450. https://doi.org/10.1007/s00402-023-05002-w
10. Huang, L., Han, W., Qi, W., Zhang, X., Lv, Z., & Lu, Y. (2023). Early unrestricted vs. partial weight bearing after uncemented total hip arthroplasty: A systematic review and meta-analysis. *Frontiers in Surgery, 10*, 1225649. https://doi.org/10.3389/fsurg.2023.1225649
11. Judd, D. L., Cheuy, V., Peters, A., Graber, J., Hinrichs-Kinney, L., & Forster, J. E. (2024). Incorporating functional strength integration techniques during total hip arthroplasty rehabilitation: A randomized controlled trial. *Physical Therapy, 104*(3), pzad168. https://doi.org/10.1093/ptj/pzad168
12. Konnyu, K. J., Thoma, L. M., Cao, W., Aaron, R. K., Panagiotou, O. A., & Bhuma, M. R. (2023a). Prehabilitation for total knee or total hip arthroplasty: A systematic review. *American Journal of Physical Medicine & Rehabilitation, 102*(1), 1–10. https://doi.org/10.1097/PHM.0000000000002006
13. Konnyu, K. J., Pinto, D., Cao, W., Aaron, R. K., Panagiotou, O. A., & Bhuma, M. R. (2023b). Rehabilitation for total hip arthroplasty: A systematic review. *American Journal of Physical Medicine & Rehabilitation, 102*(1), 11–18. https://doi.org/10.1097/PHM.0000000000002007
14. Lützner, C., Deckert, S., Günther, K. P., Postler, A. E., Lützner, J., & Schmitt, J. (2022). Indication criteria for total hip arthroplasty in patients with hip osteoarthritis—Recommendations from a German consensus initiative. *Medicina, 58*(5), 574. https://doi.org/10.3390/medicina58050574
15. Mark-Christensen, T., Thorborg, K., Kallemose, T., & Bandholm, T. (2024). Clinical benefit of physical rehabilitation after total hip and knee arthroplasty: A pragmatic randomized controlled trial (The DRAW1 trial). *Osteoarthritis and Cartilage Open, 6*(4), 100530. https://doi.org/10.1016/j.ocarto.2024.100530
16. Massachusetts General Brigham Sports Medicine. (2025). *Rehabilitation protocol for total hip arthroplasty (THA).* https://www.massgeneral.org/assets/mgh/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-total-hip-arthroplasty.pdf
17. Meng, Y., Deng, B., Liang, X., Li, J., Li, L., & Ou, J. (2022). Effectiveness of self-efficacy-enhancing interventions on rehabilitation following total hip replacement: A randomized controlled trial. *Journal of Orthopaedic Surgery and Research, 17*(1), 225. https://doi.org/10.1186/s13018-022-03116-2
18. Mohanan, C., Aseer, A. L., Jeldi, A. J., Sameer, M. M., & Kannan, S. (2025). The effect of exercises on the quality of life in individuals undergoing hip arthroplasty following hip fractures: A systematic review and meta-analysis. *European Journal of Clinical and Experimental Medicine, 23*(3), 791–799. https://doi.org/10.15584/ejcem.2025.3.20
19. Monaghan, B., Cunningham, P., Harrington, P., Hing, W., Blake, C., & O'Doherty, D. (2017). Randomised controlled trial to evaluate a physiotherapy-led functional exercise programme after total hip replacement. *Physiotherapy, 103*(3), 283–288. https://doi.org/10.1016/j.physio.2016.01.003
20. Narodowy Fundusz Zdrowia. (2023). *Wykonanie świadczeń endoprotezoplastyki stawowej w 2022 r.* https://www.nfz.gov.pl/
21. National Institute for Health and Care Excellence. (2020). *Joint replacement (primary): Hip, knee and shoulder (NG157).* https://www.nice.org.uk/guidance/ng157
22. Najwyższa Izba Kontroli. (2019). *Dostępność i finansowanie endoprotezoplastyki stawów.* https://www.nik.gov.pl/
23. Naylor, J. M., Hart, A., Harris, I. A., & Lewin, A. M. (2019). Variation in rehabilitation setting after uncomplicated total knee or hip arthroplasty: A call for evidence-based guidelines. *BMC Musculoskeletal Disorders, 20*, 214. https://doi.org/10.1186/s12891-019-2570-8
24. Orczyk, P., Gąsior, Z., Dąbek, J., & Kusz, D. (2021). Analysis of factors predisposing to degenerative hip joint lesions based on orthopaedic ward patients. *Annales Academiae Medicae Silesiensis, 75*, 49–61. https://doi.org/10.18794/aams/133452
25. Park, S. J., & Kim, B. G. (2023). Effects of exercise therapy on the balance and gait after total hip arthroplasty: A systematic review and meta-analysis. *Journal of Exercise Rehabilitation, 19*(4), 190–197. https://doi.org/10.12965/jer.2346290.145
26. Perruccio, A. V., Young, J. J., Wilfong, J. M., Power, J. D., Canizares, M., & Badley, E. M. (2024). Osteoarthritis year in review 2023: Epidemiology & therapy. *Osteoarthritis and Cartilage, 32*(2), 159–165. https://doi.org/10.1016/j.joca.2023.11.012
27. Pop, T., Bejer, A., Baran, J., & Szymczyk, D. (2018). Factors affecting the maintenance of occupational activity over a 2–3-year period after total hip replacement. *Medycyna Pracy, 69*(2), 191–198. https://doi.org/10.13075/mp.5893.00628
28. Poulsen, A. G., Gravesen, J. D., Madsen, M. N., Mikkelsen, L. R., Bandholm, T., & Rossen, C. B. (2023). Patient perspectives on home-based rehabilitation exercise and general physical activity after total hip arthroplasty: A qualitative study (PHETHAS-2). *F1000Research, 10*, 382. https://doi.org/10.12688/f1000research.51684.5

29. Sowa, K., Kotwas, A., Antczak, K., Zdziarski, K., Knyszyńska, A., & Karakiewicz, B. (2019). Postępowanie rehabilitacyjne u pacjentów po endoprotezoplastyce stawu biodrowego w okresie szpitalnym jako profilaktyka przewlekłych deficytów funkcjonalnych. *Pielęgniarstwo w Opiece Długoterminowej*, 17–24. https://doi.org/10.19251/pwod/2019.1(2)
30. Su, R., Feng, W., Liu, X., Song, Y., Xu, Z., & Liu, J. (2021). Early rehabilitation and periprosthetic bone environment after primary total hip arthroplasty: A randomized controlled trial. *Orthopaedic Surgery, 13*(5), 1521–1531. https://doi.org/10.1111/os.12984
31. Temporiti, F., Draghici, I., Fusi, S., Traverso, F., Ruggeri, R., & Grappiolo, G. (2020). Does walking the day of total hip arthroplasty speed up functional independence? A non-randomized controlled study. *Archives of Physiotherapy, 10*, 1–7. https://doi.org/10.1186/s40945-020-00079-7
32. The Ohio State University Wexner Medical Center. (2022). *Total hip arthroplasty post-operative clinical practice guideline.* https://medicine.osu.edu/-/media/files/medicine/departments/sports-medicine/medical-professionals/hip/total-hip-arthroplasty-cpg-update-2022.pdf
33. Zhu, S., Qian, W., Jiang, C., Ye, C., & Chen, X. (2017). Enhanced recovery after surgery for hip and knee arthroplasty: A systematic review and meta-analysis. *Postgraduate Medical Journal, 93*(1106), 736–742. https://doi.org/10.1136/postgradmedj-2017-134991