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Hip Pain and Mobility Deficits—Hip Osteoarthritis: Revision 2025

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health from the Academy of Orthopaedic Physical Therapy and American Academy of Sports Physical Therapy of the American Physical Therapy Association

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SUMMARY OF RECOMMENDATIONS

INTERVENTIONS - MANUAL THERAPY

A Clinicians should use manual therapy with soft tissue and/or joint mobilization, including high- and low-force long-axis hip distraction and hip mobilization with movement, to increase range of motion (ROM), decrease pain, and improve function for patients with mild-to-moderate hip osteoarthritis (OA) and impairments of joint mobility, flexibility, and/or pain.

F Clinicians may modify their manual therapy procedures and force amplitude according to the patient's bony hip morphology and tissue tolerance/irritability.

INTERVENTIONS - FLEXIBILITY, STRENGTHENING, AND ENDURANCE EXERCISES

A Clinicians should prescribe an individualized exercise program, potentially including aquatic therapy, to improve motion, strength, function, and pain, with dosages ranging from 1 to 5 times per week, each lasting 30–120 min, over a duration of 5–16 weeks.

INTERVENTIONS - DRY NEEDLING

A Clinicians should use dry needling to treat myofascial trigger point in the iliopsoas, rectus femoris, tensor fasciae latae, gluteus medius, and gluteus minimus muscles for short-term (3 weeks) improvements in muscle extensibility, pain, ROM, function, and muscle force production, in those with Grades II and III hip OA.

INTERVENTIONS - PATIENT EDUCATION

B Clinicians should provide patient education on activity modification, exercise, supporting weight reduction when overweight, and methods of unloading the arthritic joints, as well as internet-based pain coping skills training combined with exercise and/or manual therapy.

INTERVENTION - WEIGHT LOSS

B In addition to providing exercise intervention, clinicians should collaborate with physicians, nutritionists, or dietitians to support weight reduction in individuals with hip OA who are overweight or obese.

INTERVENTION - FUNCTIONAL, GAIT, AND BALANCE TRAINING

C Clinicians should provide impairment-based functional, gait, and balance training, including the proper use of assistive devices (canes, crutches, walkers), to patients with hip OA and activity limitations, balance impairment, and/or gait limitations when associated problems are observed and documented during the history or physical assessment of the patient.

C Clinicians should individualize prescription of therapeutic activities based on the patient's values, daily life participation, and functional activity needs.

INTERVENTION - ULTRASOUND

D Therapeutic ultrasound may be added to conventional physical therapy in the context of shared decision making; however, patients should be informed of the conflicting evidence on its efficacy for hip OA and any potential costs.

INTERVENTION - BRACING

F Clinicians should not use bracing as a first line of treatment. A brace may be used after exercise or manual therapies are unsuccessful in improving participation in activities that require turning/pivoting for patients with mild-to-moderate hip OA, especially in those with bilateral hip OA.

List of Acronyms

APTA: American Physical Therapy Association
AROM: active range of motion
BMI: body mass index
CPG: Clinical Practice Guideline
DN: dry needling
ER: external rotator or rotation
FABER: flexion, abduction, and external rotation
HHS: Harris Hip Score
ICD: International Classification of Diseases and Related Health Problems
ICF: International Classification of Functioning, Disability and Health
IR: internal rotator or rotation
JOSPT: Journal of Orthopaedic & Sports Physical Therapy
K-L: Kellgren–Lawrence radiographic score
MD: mean difference

MRI: magnetic resonance imaging
MTrP: myofascial trigger point
NSAID: nonsteroidal anti-inflammatory drug
OA: osteoarthritis
OR: odds ratio
PROM: passive range of motion
QOL: quality of life
RCT: randomized controlled trial
ROM: range of motion
SF-36: Medical Outcomes Study 36-Item Short-Form Health Survey
SR: systematic review
SMD: standardized mean difference
THA: total hip arthroplasty
TUG: timed up-and-go test
US: ultrasound
VAS: visual analog scale
WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index
6MWT: 6-min walk test

INTRODUCTION

AIM OF THE GUIDELINES

The American Physical Therapy Association (APTA) Orthopedics, an Academy of American Physical Therapy Association, has an ongoing effort to create evidence-based practice guidelines for orthopedic physical therapy management of patients with musculoskeletal impairments described in the World Health Organization's International Classification of Functioning, Disability and Health (ICF).[45]

The purposes of these clinical guidelines are to:

- describe evidence-based physical therapy practice, including diagnosis, prognosis, intervention, and assessment of outcome, for musculoskeletal disorders commonly managed by orthopedic and sports physical therapists;
- classify and define common musculoskeletal conditions using the World Health Organization's terminology related to impairments of body function and body structure, activity limitations, and participation restrictions;
- identify interventions supported by current best evidence to address impairments of body function and structure, activity limitations, and participation restrictions associated with common musculoskeletal conditions;
- identify appropriate outcome measures to assess changes resulting from physical therapy interventions in body function and structure as well as in activity and participation of the individual;
- provide a description to policy makers, using internationally accepted terminology, of the practice of orthopedic and sports physical therapists;
- provide information for payers and claims reviewers regarding the practice of orthopedic and sports physical therapy for common musculoskeletal conditions; and
- create a reference publication for orthopedic physical therapy clinicians, academic instructors, clinical instructors, students, interns, residents, and fellows regarding the best current practice of orthopedic and sports physical therapy.

STATEMENT OF INTENT

These guidelines are not intended to be construed or to serve as a standard of medical care for physical therapists. Standards of care are determined on the basis of all clinical data available for an individual patient and are subject to change as scientific knowledge and technology advance and patterns of care evolve. These parameters of practice should be considered guidelines only. Adherence to them will not ensure a successful outcome in every patient, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgment regarding a particular clinical procedure or treatment plan must be made in light of the clinical data presented by the patient; the diagnostic and treatment options available; and the patient's values, expectations, and preferences. However, we suggest that significant departures from accepted guidelines should be documented in the patient's medical records at the time the relevant clinical decision is made. Clinicians are encouraged to publish alternative approaches and outcomes for future evidence syntheses.

SCOPE AND RATIONALE

The 2025 Hip Pain and Mobility Deficits—Hip Osteoarthritis Clinical Practice Guideline (CPG) is a revision of the 2017 CPG and represents the second update for this CPG from APTA Orthopedics. In preparation for this update, a review was conducted on the topic of hip osteoarthritis (OA) to identify articles published after March 2016. The topics addressed in this 2025 CPG revision will specifically attempt to answer the question: What is the evidence to support physical therapy interventions directed at patients with hip OA? Prevalence, pathoanatomical features, and clinical course were discussed in detail in both the

original 2009 CPG and 2017 CPG revisions and therefore will only be briefly reviewed in this 2025 update.

Hip OA is a type of degenerative joint disease and may involve a combination of genetic, developmental, mechanical, and/or environmental factors.[44] The risk factors for the development of hip OA include age, gender, genetics, obesity, and local joint risk factors such as hip dysplasia.[38] Hip OA may develop over many years, beginning with mild arthritic changes and often progressing to a more severe arthritic condition. This degenerative process affects not only the hip joint but also the surrounding musculature.[60] While the etiology of hip OA is unclear, it consistently presents as mechanical dysfunction related to excessive loading, from conditions such as hip dysplasia (eg, acetabular retroversion) or femoroacetabular impingement syndrome.[20,23,29,35,61] Symptoms of hip OA are classically characterized by anterior groin pain with possible lateral and/or posterior hip pain. These pain complaints may progress distally down the thigh and into the knee region as the symptoms worsen and are primarily aggravated by weight bearing activities. A loss of hip range of motion (ROM) can be seen initially with internal rotation (IR) and flexion.[26,48] As the degeneration progresses, all hip movements may become decreased and painful.[1,8,9] Joint crepitus may also occur later in the degenerative process. Muscles surrounding the hip, especially the abductor muscles, progressively lose function and may contribute to an altered gait with an antalgic and/or Trendelenburg gait pattern.[27,59]

The prevalence of hip OA has been estimated to be 19.6% in the over-55-year-old adult population in the United States, with a mean age of 63.5 years. A higher prevalence was found among men when compared to women.[28] Outside the United States of America, the prevalence was found to be 8.6%.[18] Generally, hip OA is considered to be a condition found in the middle-age to older population and is rarely found in younger adults unless there was previous hip trauma or significant anatomical predisposition.

Grades of degeneration are often based on radiological signs of joint space narrowing (normal, moderate, severe, and bone-on-bone), as well as the presence of osteophytes, subchondral bone cysts, and/or sclerosis. Several studies have described grades of degeneration using clinical criteria, such as the presence of morning stiffness, degree of passive ROM deficits, joint crepitus, bony end-feel, age, and severity of gait deviations. Where the assessment of hip ROM informs clinical management, a developing consideration is that standardized ROM assessment of the hip may overlook natural variance in pelvic morphology among individuals.[53] Hip motion may differ between individuals as a result of variations in femoral version and acetabular alignment.[37] Therefore, the individual may present with unique hip motion or "hiption"[41] and considered similar to the established concept of scaption for the shoulder.

The primary intent of this third CPG on the management of hip OA by "physical therapists" is to provide updated recommendations for interventions used in physical therapist management of hip OA. Therefore, this CPG was conducted to focus on high evidence quality (Levels I and II) on interventions within the scope of physical therapist practice for patients with hip OA. The evidence regarding prevalence, pathoanatomical features, clinical course, risk factors, diagnosis, differential diagnosis, and examination did not change substantially between the original 2009 CPG and the 2017 revision. Similarly, a new literature search conducted since the 2017 revision did not yield significant additional findings on these topics. The current CPG does provide an updated imaging summary from the 2017 CPG revision based on recommendations from the American College of Radiology. This CPG excludes interventions outside the scope of those commonly used in physical therapist practice, including but not limited to pharmacological and surgical interventions, unless directly compared to physical therapy management.

METHODS

Content experts were appointed by the APTA Orthopedics to review the current literature and update the Hip OA CPG. This revision aims to provide a concise summary of contemporary evidence since publication of the last guideline and to develop new recommendations or revise previously published recommendations to support evidence-based practice. The guideline authors worked with the CPG editors and medical librarians for methodological guidance. One author (RLM) served as the team's methodologist. The research librarians were chosen for their expertise in performing systematic review (SR) and rehabilitation literature searching. Briefly, the following databases were searched for randomized controlled trials (RCTs; Level Is and II) related to physical therapy interventions from January 2016 to August 2025: MEDLINE, CINAHL, Cochrane Library, and PEDro (see **APPENDIX A** for full search strategies, search dates and results, available at www.orthopt.org).

The authors declared relationships and developed a conflict management plan, which included submitting a conflict-of-interest form to the APTA Orthopedics. Articles that were authored by a reviewer were assigned to an alternate reviewer. Funding was provided to the CPG development team for travel and expenses for CPG development training by APTA Orthopedics. The CPG development team maintained editorial independence from funding agencies, including the APTA Orthopedics Board of Directors.

Articles contributing to recommendations were reviewed based on specified inclusion and exclusion criteria, with the goal of identifying evidence relevant to physical therapist clinical decision making for patients with hip OA. The title and abstract of each article were reviewed independently by two members of the CPG development team for inclusion (see **APPENDIX B** for inclusion and exclusion criteria, available at www.orthopt.org). Full-text review was then similarly conducted to obtain the final set of articles for contribution to recommendations. The team leader (TAK) provided the final decision on discrepancies that were not resolved by the review team (see **APPENDIX C** for the flow chart of articles, available at www.orthopt.org). Data extraction and assignment of level of evidence were also performed by two members of the CPG development team in set pairings. Evidence tables for this CPG are available on the CPG's page of the APTA Orthopedics website (www.orthopt.org).

This guideline was issued in 2025 based on the published literature through October 2024 and will be considered for review in 2030, or sooner if significant new evidence becomes available. Any updates to the guideline in the interim period will be noted on the APTA Orthopedics website (www.orthopt.org).

LEVELS OF EVIDENCE

Individual clinical research articles' level of evidence was determined according to criteria adapted from the Centre for Evidence-Based Medicine, Oxford, UK (http://www.cebm.net) for the studies related to interventions.[47] In teams of two, each reviewer evaluated the quality and assigned a level of evidence for each article using a critical appraisal tool (see **TABLES 1** and **2** for the levels-of-evidence table and details on procedures used for assigning levels of evidence, available at www.jospt.org). If the two content experts did not agree on a level of evidence for a particular article, a third content expert was used to resolve the issue. The evidence update was organized from the highest level of evidence to the lowest level of evidence. An abbreviated version of the levels of evidence grading system is provided below.

STRENGTH OF EVIDENCE AND GRADES OF RECOMMENDATION

The strength of the evidence supporting the recommendations was graded according to the established methods provided below (**TABLE 2**). Each team developed recommendations based on the strength of evidence, including how directly the studies addressed physical therapy interventions for those with hip OA. In developing their recommendations, the authors considered the strengths and limitations of the body of evidence as well as the health benefits, side effects, and risks associated with the interventions.

TABLE 1 Levels of Evidence

I	Evidence obtained from high quality diagnostic studies, prospective studies, systematic reviews, or randomized controlled trials
II	Evidence obtained from lesser-quality diagnostic studies, systematic reviews, prospective studies, or, randomized controlled trials (eg,, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)
III	Case controlled studies or retrospective studies
IV	Case series
V	Expert opinion

TABLE 2 Grades of Recommendation

Grades of Recommendation		Strength of Evidence	Level of Obligation
A	Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This grade must include at least 1 level I study	Must or should
B	Moderate evidence	A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation	Should
C	Weak evidence	A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation	May
D	Conflicting evidence	Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting study results	
E	Theoretical/ foundational evidence	A preponderance of evidence from animal or cadaver studies, from conceptual models/principles, or from basic sciences/bench research support this conclusion	May
F	Expert opinion	Best practice based on the clinical experience of the guidelines development team supports this conclusion	May

REVIEW PROCESS

The APTA Orthopedics selected consultants from the following areas to serve as reviewers throughout the development of these CPGs:

- individuals with hip OA
- claims review
- coding
- guideline methodology
- hip pain rehabilitation
- medical practice guidelines
- manual therapy
- movement science
- orthopedic physical therapy clinical practice
- orthopedic physical therapy residency education
- orthopedic surgery
- outcomes research
- physical therapy academic education
- physical therapy patient perspective

Identified reviewers who are experts in the management and rehabilitation of those with hip OA reviewed a prepublication draft of this CPG content and methods for integrity, accuracy, validity, usefulness, and impact. Comments, suggestions, or feedback from the expert reviewers was delivered to the author and editors for consideration and appropriate revisions. This guideline was also posted for public comment on the APTA Orthopedics website (www.orthopt.org), and a notification of this posting was sent to the members of the APTA Orthopedics. Any comments, suggestions, and feedback gathered from public commentary were sent to the authors and editors to consider and make appropriate revisions in the guideline prior to submitting them for publication to the *Journal of Orthopaedic & Sports Physical Therapy* (*JOSPT*).

DISSEMINATION AND IMPLEMENTATION TOOLS

In addition to publishing these guidelines in the *JOSPT*, these guidelines will be posted on following websites with free access: *JOSPT*, APTA Orthopedics, ECRI Guidelines Trust (guidelines.ecri.org), Guidelines International Network, and the Physiotherapy Evidence Database (www.PEDro.org.au). The planned implementation tools for patients, clinicians, educators, payers, policy makers, and researchers, and the associated implementation strategies are listed in **TABLE 3**.

ORGANIZATION OF THE GUIDELINE

Prevalence, pathoanatomical features, and clinical course of hip OA are briefly reviewed in the introduction. The 2017 CPG recommendations are restated for risk factors, diagnosis, and differential diagnoses, as well as examinations related to outcome measures, activity/participation restriction measures, and physical impairment measures. The authors of this 2025 CPG update have provided a "Best Practice Points" for a hip examination based on expert opinion. Related to physical therapy interventions for those with hip OA, an SR was conducted to identify RCTs or SRs and meta-analyses of RCTs that support specific actionable recommendations. When appropriate, the prior 2017 recommendation was provided, followed by a summary of updated literature with the corresponding evidence levels, synthesis of evidence, and rationale for the recommendation(s) with harms and benefits statements, gaps in knowledge, and updated recommendation(s).

TABLE 3 Planned Strategies and Tools to Support the Dissemination and Implementation of This Clinical Practice Guideline

Tools	Strategy
"Perspectives for Patients"	Patient-oriented guideline summary available on www.jospt.org and www.orthopt.org
Mobile application of guideline-based exercises for patient/clients and health care practitioners	Marketing and distribution of app using www.orthopt.org
Clinician's Quick-Reference Guide	Summary or guideline recommendations available on www.orthopt.org
Read-for-credit continuing education units	Continuing education units available for physical therapists and athletic trainers from JOSPT
Webinars educational offering for health care practitioners	Guideline-based instruction available for practitioners on www.orthopt.org
Mobile and web-based app of guideline for training of health care practitioners	Marketing and distribution of app using www.orthopt.org
Non-English versions of the guidelines and guideline implementation tools	Development and distribution of translated guidelines and tools to JOSPT's international partners and global audience via www.jospt.org
APTA CPG+	Dissemination and implementation aids

Abbreviations: APTA, American Physical Therapy Association; CPG, clinical practice guideline.

CLINICAL GUIDELINES

Impairment/Function-Based Diagnosis

CLASSIFICATION

The primary *International Classification of Diseases, 10th Revision* (ICD-10), code and condition associated with hip pain and mobility deficits **is M16.1 Primary coxarthrosis, unilateral**. In the International Classification of Diseases and Related Health Problems (ICD), the term *OA* is used as a synonym for arthrosis or osteoarthrosis. Other secondary codes associated with hip OA are **M16.0 Primary coxarthrosis, bilateral**; **M16.2 Coxarthrosis resulting from dysplasia, bilateral**; **M16.3 Dysplastic coxarthrosis, unilateral**; **M16.4 Posttraumatic coxarthrosis, bilateral**; **M16.5 Posttraumatic coxarthrosis, unilateral**; **MI6.7 Secondary coxarthrosis, not otherwise specified**; **M25.65 Stiffness in hip**; and **M25.55 Pain in hip**.

The primary ICF body function codes associated with the above-noted primary ICD-10 conditions are the sensory functions related to pain and the movement-related functions related to joint mobility. These body function codes are **b28l6 Pain in joints** and **b7100 Mobility of a single joint**.

The primary ICF body structure codes associated with hip pain and mobility deficits are **s75001 Hip joint, s7402 Muscles of the pelvic region**, and **s7403 Ligaments and fascia of the pelvic region**.

The primary ICF activities and participation codes associated with hip pain and mobility deficits are **d4154 Maintaining a standing position**, **d4500 Walking short distances**, and **d4501 Walking long distances**. A comprehensive list of codes was published in the previous guideline.[15]

PREVALENCE

2017 Summary

OA is the most common cause of hip pain in older adults (older than 50 years of age). Prevalence rates for adult hip OA range from 0.4% to 27%. The reported prevalence of hip OA continues to show great variability, with men showing higher prevalence of radiographic hip OA than women.

Pathoanatomical Features

2017 SUMMARY

Early articular changes observed on imaging may help identify individuals who have not been clinically diagnosed with hip OA. In patients with hip pain, there is some evidence that the presence of acetabular retroversion is related to the development of hip OA.

Clinical Course

2017 SUMMARY

Total hip arthroplasty (THA) is the most common surgical procedure for end-stage hip OA. Despite the success of THA and knee arthroplasty over the last three decades, consensus on criteria for the timing of surgery has not been established. However, the Group for the Respect of Ethics and Excellence in Science suggests that nonsurgical intervention has failed if a patient has not experienced a reduction in symptoms, such as a 20%–25% improvement on the Western Onterio and McMaster Universities Osteoarthritis Index (WOMAC) Pain subscale and has progressive loss of joint space of between 0.3 and 0.7 mm per year. The rate of hip OA progression varies from patient to patient; thus, physical therapists should monitor the clinical course of hip OA (ROM and strength) and baseline hip pain, Kellgren–Lawrence (K-L) grades, joint space width, and outcome score.

Risk factors

2017 SUMMARY

Age, history of hip developmental disorders, previous hip joint injury, reduced hip ROM (especially hip IR), presence of osteophytes, lower socioeconomic status, higher bone mass, and higher body mass index (BMI) are risk factors for developing hip OA.

Natural History

2017 SUMMARY

The natural history of hip OA is not completely understood. Arthritic changes occur both inside and outside of the hip joint, resulting in loss of joint space, development of osteophytes, and subchondral sclerosis and cysts. Joint ROM is reduced, and muscle weakness develops around the joint with a progression of OA. Degenerative hip changes develop more frequently in those with developmental dysplasia as compared to those with structurally normal hips. Those with cam deformities develop hip OA more rapidly. Cam deformities that develop after slipped capital femoral epiphysis are related to the development of early hip OA.

Diagnosis/Classification

2017 RECOMMENDATION

A Clinicians should use the following criteria to classify adults over the age of 50 years into the ICD category of coxarthrosis and the associated ICF impairment-based category of hip pain (**b28016 Pain in joints**) and mobility deficits (**b7100 Mobility of a single joint**): moderate anterior or lateral hip pain during weight-bearing activities, morning stiffness less than 1 hr in duration after awakening, hip IR ROM less than 24° or IR and hip flexion 15° less than the nonpainful side, and/or increased hip pain associated with passive hip IR.

DIFFERENTIAL DIAGNOSIS

2017 Recommendation

F Clinicians should revise the diagnosis and change their plan of care, or refer the patient to the appropriate clinician, when the patient's history, reported activity limitations, or impairments of body function and structure are not consistent with those presented in the diagnosis/classification section of this guideline or when the patient's symptoms are not diminishing with interventions aimed at normalization of the patient's impairments of body function.

IMAGING STUDIES

2017 Summary

Plain-film radiography is the most often used method when radiographically diagnosing and assessing the progression of hip OA. Radiographs are used to look for the amount of joint space narrowing, the presence of osteophytes, and subchondral sclerosis or cysts. Research on imaging methods, using magnetic resonance imaging (MRI) and ultrasound (US) that can identify prearthritic changes, is still under way. Much of the imaging research has looked at how hip dysplasia and femoral acetabular impingement may predispose hips to OA; however, results to date are not conclusive.

2025 UPDATE

Several countries including the United Kingdom, Ireland, Australia, Norway, Sweden, parts of Canada, and several states within the United States of America allow physical therapists to directly refer for imaging studies.[40] When physical therapists are considering referring a patient for imaging studies, the American College of Radiology criteria for "chronic hip pain" should be used. Radiographs of both the pelvis and hip are usually appropriate as initial imaging studies.[2] If radiographs are normal or inconclusive, diag-

nostic US of the area of interest may be appropriate to assess for extra-articular pathologies and a limited number of nonarthritic intra-articular conditions. Other imaging such as MRI or CT with or without contrast may also be appropriate if radiographic and diagnostic US studies are normal or inconclusive and clinical findings do not provide sufficient diagnostic guidance.

A number of different classification systems exist for the radiographic diagnosis of OA, including the Tonnis, Coft, and K-L, with K-L being identified as generally the most common method.[18,34] The K-L radiographic score ranges from Grades 0 to 4. Grade 0 is classified as no presence of OA and no joint space narrowing or reactive changes. Grade 1 is classified as doubtful narrowing of the joint space with possible osteophyte formation. Grade 2 is classified as possible narrowing of the joint space and osteophyte formation. Grade 3 is classified as definite narrowing of joint space, moderate osteophyte formation, some sclerosis, and possible deformity of bony ends. Grade 4 is classified as large osteophyte formation, severe narrowing of the joint space with marked sclerosis, and definite deformity of bone ends.[32]

Tonnis classification is another system frequently used by surgeons to describe degenerative changes.[34] Grade 0 represents a normal hip joint with no signs of OA. Grade 1 indicates early changes, such as minor narrowing of the joint space, slight bone spurs at the joint margins, and mild sclerosis affecting the femoral head or acetabulum. In Grade 2, the condition progresses to include small subchondral cysts, more pronounced joint space narrowing, and a moderate loss of the femoral head's round shape. Grade 3 is the most advanced stage, characterized by large cysts, severe narrowing or obliteration of the joint space, significant deformity of the femoral head, and signs of avascular necrosis.[58]

CLINICAL GUIDELINES

Activity Limitation/Physical Performance Measures

2017 RECOMMENDATIONS

A To assess activity limitation, participation restrictions, and changes in the patient's level of function over the episode of care, clinicians should utilize reliable and valid physical performance measures, such as the 6-min walk test (6MWT), 30-s chair stand, stair measure, timed up-and-go (TUG) test, self-paced walk, timed single-leg stance, four-square step test, and step test.

A Clinicians should measure balance performance and activities that predict the risk of falls in adults with hip OA, especially those with decreased physical function or a high risk of falls because of past history. Recommended balance tests for patients with OA include the Berg Balance Scale, four-square step test, and timed single-leg stance test.

F Clinicians should use published recommendations from the APTA Geriatrics to guide fall risk management in patients with hip OA to assess and manage fall risk.

Physical Impairment Measures

2017 RECOMMENDATION

A When examining a patient with hip pain/hip OA over an episode of care, clinicians should document the flexion, abduction, and external rotation (FABER; or Patrick's) test and passive hip ROM and hip muscle strength, including IR, external rotation (ER), flexion, extension, abduction, and adduction.

Examination

OUTCOME MEASURES: ACTIVITY

2017 Recommendation

A Clinicians should use validated outcome measures that include domains of hip pain, body function impairment, activity limitation, and participation restriction to assess outcomes of treatment of hip OA.

2025 BEST PRACTICE POINTS

Essential Data Elements

Clinicians should use at least one of the following self-reported and at least one physical performance measures, in addition to all the physical impairment measures, for all patients with hip OA to accurately determine the patient's diagnostic classification and response to intervention while supporting standardization for quality improvement in clinical care. Physical performance measures should be chosen based on the individual's activity limitations and relevant physical impairments. Self-reported, physical performance, and impairment measures should be obtained at baseline and at one follow-up time point, which could include discharge.

Activity Limitation - Self-Report Measures

- WOMAC Physical Function subscale
- Hip Disability and Osteoarthritis Outcome Score
- Patient-Reported Outcomes Measurement Information System

Activity Limitation - Physical Performance Measures

- 6MWT
- 30-s chair-stand test
- TUG
- Timed stair performance

Physical Impairment Measures

- Hip ROM and muscle strength for the following:
  - IR
  - ER
  - Flexion
  - Extension
  - Abduction
  - Adduction
- Pain
  - Numeric Pain Rating Scale
- Joint irritability
  - FABER test

CLINICAL GUIDELINES

Interventions

MANUAL THERAPY

Operational Definitions

The terms used in the manual therapy section require operational definitions for consistency with previously published CPGs. Joint mobilizations include thrust and nonthrust techniques and cover a continuum of skilled passive movement applied at varying speeds and amplitudes within or at the end ROM of a joint. Thrust procedures are those provided with low amplitude and high velocity. Techniques that address soft tissue restrictions and/or pain can include soft tissue mobilization, massage, dry cupping, and instrument-assisted techniques. Soft tissue mobilization is defined as skilled passive movement of soft tissue, including fascia, muscles, and ligaments, to reduce pain or improve ROM and may include instrument-assisted soft tissue mobilization, myofascial release, myofascial trigger point (MTrP) therapy, muscle energy, and strain/counterstrain techniques.[22]

2017 Recommendations

A Clinicians should use manual therapy for patients with mild-to-moderate hip OA and impairment of joint mobility, flexibility, and/or pain. Manual therapy may include thrust, nonthrust, and soft tissue mobilization. Doses and duration may range from 1 to 3 times per week for up to 6–12 weeks in patients with mild-to-moderate hip OA. As hip motion improves, clinicians should add exercises, including stretching and strengthening, to augment and sustain gains in the patient's ROM, flexibility, and strength.

Evidence Update

I An RCT by Josipovic[25] compared machine-based traction with hip vibration (n = 10; M_{age} = 71 years; nine women, one man), manual traction with hip vibration (n = 10; M_{age} = 74 years; eight women, one man), and sham machine-based traction (n = 8; M_{age} = 73 years; seven

women, one man) in those with hip OA Grades II–IV. Treatments were performed twice per week over 12 weeks with machine-based treatments at a traction force range of 400–600 N and a vibration range of 6–15 Hz. The machine-based traction–vibration and manual traction–vibration were significantly superior to the sham group in improving Harris Hip Score (HHS; $p = .005$; mean difference [MD] = 13.98 and $p < .001$; MD = 20.30), decreasing pain ($p = .002$; MD = –1.62 and $p < .001$; MD = –2.20) and TUG ($p = .012$; MD = –2.10 and $p = .011$; MD = –2.16). Machine-based traction–vibration and manual traction–vibration were not statistically significantly different. Also, there was no difference in gait assessments when comparing all three treatments.

I The results of an SR by Ceballos-Laita and Estebanez de Miguel[10] identified high-quality evidence to support manual therapy to increase ROM, decrease pain, and improve function for those with hip OA. In this review, one study ($n = 40$; $M_{age} = 78 \pm 6$ years; 54% female, 46% male) found a single session of mobilization with movement to immediately decrease pain ($d = 1.9$), increase flexion ROM ($d = 3.0$), increase IR ROM ($d = 1.4$), improve TUG ($d = 1.0$), increase repetitions with 30-s chair stand ($d = 1.7$), and improve 40-m self-paced walk ($d = 1.5$).[4]

II In an effort to investigate the effects of manual therapy dosage on outcomes, Shepherd et al.[52] completed an SR that included 10 studies and a total of 768 participants. The most common treatment dosages were 10–30 min of manual therapy per session at a frequency of 2–3 times per week for 2–6 weeks. It should be noted that these findings should be interpreted with caution as five of the 10 studies had a high risk of bias. Therefore, recommending a specific manual therapy dosage for those with hip OA could not be made.

II Estebanez-de Miguel et al. published two studies,[16,17] which were included in the Shepherd SR[52] and one in the Ceballos-Laita SR,[10] that investigated the effect of three treatment sessions of high-force (stretching exceeding resistance), medium-force (stopping at the point of resistance), or low-force (no resistance) long-axis distraction mobilization in open packed position on outcomes. The studies had a 1-week follow-up on the same 60 subjects ($M_{age} = 63 \pm 9.7$ years; 35 men, 25 women) with Grade III hip OA. One study found hip ROM increased significantly ($p < .05$) in the high-force mobilization group (flexion: 10.6°, extension: 8.0°, abduction: 6.4°, adduction: 3.3°, ER: 5.6°, IR: 7.6°). These changes were significant ($p < .05$) compared to the low-force group. There were no significant changes in the low-force and medium-force groups for hip ROM. The second study found the three mobilization groups showed significant improvements in pain and in physical function ($p < .05$). Specifically, a significant difference was found between groups in pain pressure thresholds, with the low-force group showing the largest effects size ($d = 2.0$). The high-force group showed the largest effects size for physical function ($d = 0.5–0.7$) as measured by the WOMAC Physical Function subscale, TUG, and 40-m self-placed walk test.

II Included in the Shepherd SR,[52] Pawlowska et al.[46] compared manual therapy plus US and magnetic therapy to US, magnetic therapy, and non–weight-bearing exercises in 57 female patients ($M_{age} = 59.7$ years) with hip OA. Manual therapy consisted of mobilization in ER and hip abduction with distraction for six treatments over 2 weeks. Results included significant increases in hip ROM for abduction (PROM: $p = .0044$; MD = 2.95), extension (active range of motion [AROM]: $p = .0001$; MD = 2.32; PROM: $p = .0015$; MD = 2.59), and IR (AROM: $p < .0001$; MD = 2.14; PROM: $p < .0001$; MD = 2.77), pain reduction ($p = .0001$; MD = 7.12), and increase in function (Lequesne index: $p < .0001$; MD = 3.97).

Evidence Synthesis

In total, five additional studies (two Level I and three Level II) that support the use of manual therapy have been added since the 2017 CPG. Four studies support long-axis distraction to increase ROM, decrease pain, and improve function with treatment from 1 to 12 weeks. Higher forces for distraction may be better to increase ROM, while lower forces may be better suited to decrease pain. One study identified an immediate effect for increasing ROM following hip mobilization with movement. For patients with mild-to-moderate hip OA, dosing and duration can vary from 1 to 3 times per week over 6–12 weeks. As hip motion improves, exercises such as stretching and strengthening can be used to enhance and maintain gains in ROM, flexibility, and strength. No harms of manual therapy were reported.

Gaps in Knowledge

More research is needed to support the specific techniques and dosages that are most beneficial for patients with varying degrees of hip arthritis. Moreover, investigating manual therapy techniques that consider patient/client hip morphology and how structure impacts natural/physiologic movement planes is also needed. Additional follow-up studies are needed to assess if there are longer-term benefits of manual therapy treatments, over the recognized short-term benefits, and if manual therapy interventions are beneficial for enhancing exercise interventions.

2025 Recommendations

A Clinicians should use manual therapy with soft tissue and/or joint mobilization, including high- and low-force long-axis hip distraction and hip mobilization

with movement, to increase ROM, decrease pain, and improve function for patients with mild-to-moderate hip OA and impairments of joint mobility, flexibility, and/or pain.

F Clinician may modify their manual therapy procedures and force amplitude according to the patient's bony hip morphology and tissue tolerance/irritability.

FLEXIBILITY, STRENGTHENING, AND ENDURANCE EXERCISES

Operational Definitions

The terms used in the manual therapy section require operational definitions for consistency with previously published CPGs. Flexibility is the ability to move a joint through its complete ROM. Many factors impact ROM, including distensibility of the joint capsule, adequate warm-up, muscle viscosity, and tightness of ligaments and tendons.[42] Muscle strengthening and endurance exercises are interventions prescribed to restore strength, endurance, or power of muscle.[31]

2017 Recommendation

A Clinicians should use individualized flexibility, strengthening, and endurance exercises to address impairments in hip ROM, specific muscle weaknesses, and limited thigh (hip) muscle flexibility. For group-based exercise programs, effort should be made to tailor exercises to address patients' most relevant physical impairments. The dosage and duration of treatment for effect should range from 1 to 5 times per week over 6–12 weeks in patients with mild-to-moderate hip OA.

Evidence Update

I Teirlinck et al.[57] conducted a meta-analysis of 18 RCTs (n = 5–102) that examined the effects of exercise therapy compared to no treatment on pain and self-reported physical function. Outcomes were pain and/or function measured in the short term (directly after end of treatment) and/or long term (6–9 months after treatment). Treatment sessions ranged between 30 and 120 min, 1–3 times per week with durations between 5 and 16 weeks. A short-term posttreatment beneficial effect was found for exercise therapy on pain (standardized mean difference [SMD] = −0.38; 95% CI [0.55, −0.22]) and function (SMD = −0.31; 95% CI [0.49, −0.11]). A long-term beneficial effect was reported for exercise therapy on pain (SMD = −0.23; 95% CI [0.41, −0.05]) and function (SMD = −0.29; 95% CI [0.45, −0.12]) at 6–9 months after treatment. The majority of studies reported effect estimates were small, and it could not be determined if they were clinically meaningful. This meta-analysis included an RCT by Bieler et al.[7] but did not include a secondary analysis[6] or a subsequent study by Bieler et al.[5] These three studies examined the effects of progressive strength training, Nordic walking, and unsupervised home-based exercises on functional outcomes, including the 30-s chair stand test, timed stair-climbing test, 8-ft up-and-go test, 15-s marching-in-place test, and 6MWT. Hip and thigh muscle strength (hip: external/internal rotators, flexors, abductors/adductors; knee: extensors and flexors) and quadriceps muscle mass were also assessed. The results of the three studies found that, at 2, 4, and 12 months, progressive strength training was superior to Nordic walking, which was superior to unsupervised home-based exercise for function. At 2 months, Nordic walking was superior to unsupervised home-based exercise groups for the hip flexors (MD = 9.4 Nm; 95% CI [1.4, 17.3]; $p < .05$) and for the hip abductors (MD = 7.6 Nm; 95% CI [1.3, 13.9]; $p < .05$), and progressive strength training was superior to Nordic walking for the hip adductors (MD = −6.0 Nm; 95% CI: −12.1, 0.0; $p < .05$). At 4 months, progressive strength training showed greater improvements in muscle mass than the Nordic walking group (MD = 2.3 cm^2; 95% CI [0.6, 3.9]; $p = .004$) and the unsupervised home-based exercise group (MD = 2.3 cm^2; 95% CI [0.8, 3.9]; $p = .002$). Related to adverse events, James et al.[24] conducted an SR of 14 studies with 707 and 436 patients in the exercise and control groups, respectively; found a low frequency of adverse events; and suggested that exercise-related risk of harm is minimal.

I Sampath et al.[51] performed a meta-analysis of six studies (n = 613) to compare therapeutic exercise versus a control group. The findings identified high-quality evidence that exercise significantly contributes to pain reduction, improvement in physical function, and enhancement of overall quality of life (QOL). The control groups included care provided by a general practitioner, usual care, waiting list, and patient education. Outcomes included pain posttreatment, pain at follow-up, physical function, and QOL. Six studies reported that exercise was found to significantly reduce posttreatment pain (SMD = −0.27; 95% CI [−0.5, −0.04]) and to improve physical function (SMD = −0.29; 95% CI [−0.47, −0.11]) when compared to the control group. The effect size ranged from small to moderate. Five studies (n = 509) reported that exercise was found to significantly reduce pain for at follow-up time frames ranging from 3 weeks to 2 years (SMD = −0.24; 95% CI [−0.41, −0.06]) and to improve physical function (SMD = −0.33; 95% CI [−0.5, −0.15]) when compared to the control group. The effect size ranged from small to moderate. Three studies (n = 335) reported no significant difference between exercise and the control group for QOL (SMD = −0.06; 95% CI [−0.27, 0.16]).

I Moseng et al.[43] conducted a meta-analysis of 12 RCTs (n = 1,202) to compare effects of land-based exercise programs with high versus low or uncertain compliance on pain and self-reported physical function. The

patients were 63% (range: 41%–74%) female with a mean age of 66 years (range: 58–71). Eligible intervention could be any land-based exercise programs that utilized strengthening, flexibility, and/or cardiorespiratory exercises. Control interventions could be no treatment or any treatment that did not involve therapeutic exercise. The average length of treatment episode was 10 weeks (range: 5–12). For pain, a small SMD of −0.24 (95% CI [−0.42, −0.06]) favored exercise over no exercise. Comparisons of the high compliance exercise group showed improvement in pain with a moderate SMD of −0.42 (95% CI [−0.58, −0.26]), while a comparison with the group with uncertain compliance yielded an inconclusive result. Comparisons of self-reported physical function showed improvement with a small-to-moderate SMD of −0.34 (95% CI [−0.50, −0.18]) in favor of exercise compared to no exercise. Comparison of physical function showed improvement with a moderate SMD of −0.41 (95% CI [−0.58, −0.24]) in favor of high compliance compared to uncertain compliance. A high compliance to land-based supervised exercise interventions resulted in larger improvements in pain and self-reported physical function compared with land-based supervised exercise interventions with uncertain compliance.

I Svege et al.[55] performed an RCT examining the effects of education and exercise, which consisted of a warm-up, strengthening, functional exercises, and stretching (n = 55; M_{age} = 58.4 ± 10 years; 31 women, 24 men) versus education alone (n = 54; M_{age} = 57.2 ± 9.8 years; 28 women, 26 men) at baseline, 4 months, 10 months, and 29 months using hip ROM, isokinetic concentric muscle strength of knee flexion, and extension. Additional measures included the Astrand test, visual analog scale (VAS; 0–10), and distance and pain during the 6MWT. The time period for the intervention was 15 weeks. A statistically and clinically significant difference was found for decreasing pain on the VAS during the 6MWT (4 months: MD = −4.4; 95% CI [−11.3, 2.4]; 10 months: MD = −8.5; 95% CI [−16.1, −0.9]; 29 months: MD = −9.3; 95% CI [−18.1, −0.6]; p = .018). There were no other significant differences for the other outcomes at any of the follow-up time frames. Patients who received exercise in addition to education had a statistically and clinically significant reduction in pain during walking at 10- and 29-month follow-up assessments.

I Steinhilber et al.[54] performed an RCT, and a secondary analysis by Krauss et al.[36] investigated the effects of physical therapist–supervised Tubingen exercise approach (n = 70; M_{age} = 58 ± 19 years) versus a control group (n = 68; M_{age} = 60 ± 9 years) and placebo US group (n = 70; M_{age} = 58 ± 10 years) at baseline and 12 weeks. The Tubingen exercise approach consisted of physical, social, and cognitive elements. Specifically, the physical element included mobilizations, strengthening, and improvements to postural control. Outcome measures included hip muscle strength for hip abduction, hip adduction, hip flexion, hip extension, and kinematic analysis of gait. Significant differences were found between the Tubingen group and the control group for all hip muscle strength, with p < .05 and MDs ranging from 0.11 to 0.27. Significant differences were found between the Tubingen group and the placebo US group for all hip muscle strength, with p < .05 and MDs ranging from 0.09 to 0.19. No significant difference was seen for strength in any of the hip muscles between the control and placebo US groups. Supervised Tubingen exercises may be safely used to improve hip muscle strength after 12 weeks. There were no significant differences between any of the groups for kinematic parameters of gait. Another secondary analysis (Level II) by Roesel et al.[49] investigated outcomes at 3-, 6-, and 12-month follow-ups using the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and WOMAC Pain, Physical Function, and Stiffness subscales. There was a significant difference in favor of the Tubingen exercise group on the WOMAC Function subscale (adjusted MD = 6.41; 95% CI [1.61, 11.22]; p = .009) between the 3- and 6-month follow-ups. There were no significant findings for any other outcomes at 3, 6, and 12 months. No effect sizes were calculated or reported.

I An RCT study by Rostron et al.[50] investigated the effects of targeted gluteal intervention group consisting of gait training, strengthening, pelvic stability, and global strengthening (n = 13; M_{age} = 58.2 ± 10.9 years; six women, seven men) compared to a sham exercise intervention (n = 14; M_{age} = 60.1 ± 7.3 years; seven women, seven men,) on hip muscle volume and isometric strength after 12 weeks. There was a significant difference between groups in gluteus minimus muscle volume in favor of the exercise group across both limbs, Time × Group effect: $F(1, 25) = 5.70$, p = .025. The gluteus minimus muscle volume increased in the exercise group in both limbs (pooled MD = 0.06 cm^3/kg; 95% CI [0.01, 0.11]) with moderate effect sizes (affected limb: d = 0.70, contralateral limb: d = 0.87). The pattern of changes in hip isometric strength measurements were not different between groups, Time × Group effect: $F(1, 25) \leq 1.91$, $p \geq .179$, with effect sizes that ranged between d = 0.00 and 0.51 for all strength measures in the affected limb and d = 0.02 and 0.43 in the contralateral limb.

I Teirlinck et al.[56] conducted a meta-analysis of exercise-based treatments and found high-quality evidence that supports land-based exercise for long term (6–8 months) and moderate-quality evidence for short term (immediately after treatment) for reducing pain and physical disability when compared to no treatment, usual care, medication, or education. Interventions were mostly land based, with one study using aquatic exercise. Control groups consisted of education, medication, waiting lists,

general practice care, or usual care. The final review included 14 studies and a total of 1,242 participants. Interventions lasted from 5 to 12 weeks. Outcomes were assessed directly after the treatment was completed in 12 trials (n = 1,178) and 6–8 months after completing treatment in six trials (n = 519). All studies assessed pain, function, and patient global assessment. There was a significant improvement with exercise supervised by a physical therapist in short-term and long-term outcomes; short-term treatment experimental group (n = 589) and control group (n = 589) Mantel–Haenszel risk difference (0.14; 95% CI [0.06, 0.22]); heterogeneity: Tau = 0.01, χ = 36.76, df = 11 (p = .0001), I^2 = 70%; test overall effect: Z = 3.32 (p = .0009); and long-term experimental group (n = 257) and control group (n = 262) Mantel–Haenszel risk difference (0.14, 95% CI [0.07, 0.20]); heterogeneity: Tau = 0.00, χ = 1.74, df = 5 (p = .88), I^2 = 0%; test overall effect: Z = 4.02 (p < .0001).

I Geigle et al.[21] conducted a meta-analysis of seven RCTs and two non-RCTs studies (n = 303) that examined the effect of exercise in the aquatic environment. Outcomes included physical performance or functional performance or health-related QOL. These nine studies included a total of 303 patients with an average age of 68 ± 9 years and 76% (231/303) being female. The average symptom duration was 10.5 ± 10.6 years, and intervention time was 8.8 ± 4.1 weeks with a range of 3–12 weeks. The majority of studies reported session durations of 40–60 min performed 2–3 times per week. Patients attended 12–52 formal intervention sessions. A significant improvement in lower extremity functional levels with intervention was reported (p = .00); the SMD was small to moderate (0.29). Patients who participated in aquatic-based exercise programs experienced an overall improved ROM, strength, balance, gait, and functional performance (p = .00; SMD = 0.30) and pain (p = .00; SMD = 0.34). There was no significant change in self-reported QOL (p = .07; SMD = 0.15). Performing prescribed exercises in the aquatic environment improved and maintained lower extremity function and pain outcomes but did not result in measurable change in self-reported QOL.

II An RCT by Fukumoto et al.[19] investigated the effects of high-velocity (n = 15; M_{age} = 51.9 ± 7.0 years; 100% female) and low-velocity (n = 17; M_{age} = 53.1 ± 10.2 years; 100% female) resistance exercises on gait kinematics and kinetics. Exercises included hip abduction in the supine position, hip extension in the prone position, and hip flexion and knee extension in the sitting position. For all exercises, the participants performed two sets of 10 repetitions for the first 2 weeks and three sets of 10 repetitions for the remaining weeks. The high-velocity group performed the concentric phase as fast as possible and the eccentric phase of each contraction in 3 s. The low-velocity group performed both the concentric and eccentric portions of each contraction in 3 s. After 8 weeks, there were no significant differences between groups in changes in walking speed, cadence, stride length, gait kinematics and kinetics, muscle strength, muscle power, HHS (0–100), or VAS (0–100).

Evidence Synthesis

In total, five meta-analyses, one SR, and eight RCTs (six Level I, two Level II) have been conducted to support exercise since the 2017 CPG. Exercise dosage has included sessions ranging from 30 to 120 min, 1–3 times a week, for 5–16 weeks. Progressive strength training was found to be superior to aerobic exercise, with both of these interventions being better than unsupervised home-based exercises. The addition of exercise to education is also favored over education alone. A program with gait training, strengthening, pelvic stability, and global strengthening was found to improve hip muscle volume over a sham exercise. There is also support of aquatic-based exercise programs to improve overall ROM, strength, balance, gait, and functional performance. There was no difference between high- versus low-velocity resistance exercises over the short term (8 weeks) to improve gait, muscle strength/power, function, or pain. It should be noted that one SR found a low frequency of adverse events and suggested that exercise-related risk of harm is minimal.

Gaps in Knowledge

More research is needed to study the use of both land and aquatic exercise programs of varying dosages, including different treatment frequencies per week on certain subtypes of hip OA based on the K-L score and on control groups.

2025 Recommendation

A Clinicians should prescribe an individualized exercise program, potentially including aquatic therapy, to improve motion, strength, function, and pain, with dosages ranging from 1 to 5 times per week, each lasting 30–120 min, over a duration of 5–16 weeks.

DRY NEEDLING

2017 Recommendation

None.

Evidence Update

I An RCT by Cebellos-Laita et al.[11] compared the short-term effects of dry needling (DN; n = 19; M_{age} = 53.6 ± 4.03 years; 10 women, nine men) to self-stretching (n = 19; M_{age} = 55.0 ± 4.1 years; 10 women, nine men). The primary outcomes for hip muscle extensibility were measured using the Ely test, the modified Ober test, and the active knee extension test. The secondary outcomes were pain, stiffness, and physical function measured

by the WOMAC questionnaire. The DN group treatment included a fast-in fast-out technique using a 0.25 × 50 mm needle into MTrPs in the iliopsoas, rectus femoris, and tensor fasciae latae muscles, performed once a week for 3 weeks. The self-stretching group stretched the same muscles as the DN group for 15 min, 2 times a day, for 3 weeks. Each muscle was stretched for 45 s on and 15 s off for three repetitions. The DN group had significant improvements for Group × Time interaction for the Ely test (F = 4.8; p = .037, d = 0.7) and Ober test (F = 21.2; p < .001, d = 2.5). Specifically, the DN group improvements for muscle extensibility were 12.8° (95% CI [3.58, 26.09]) with the Ely test and 5.21° (95% CI [3.66, 6.76]) with the Ober test. There were no significant findings for any other outcomes.

An RCT by Cebellos-Laita et al.[13] compared the short-term effects of DN (n = 15; M_{age} = 55.5 ± 4.7 years; seven women, eight men) versus sham DN (n = 15; M_{age} = 58.6 ± 6.6 years; six women, nine men). The participants had either a grade of II or III using the K-L classification of hip OA. The primary outcome was hip pain (VAS 0–10 cm). The secondary outcomes were hip ROM (IR, ER, hip flexion, hip abduction, adduction, hip extension) and physical function (30-s chair-stand test and 20-m walk test). The DN group treatment included a fast-in fast-out technique using a 0.25 × 50 mm needle into MTrPs in the iliopsoas, rectus femoris, tensor fasciae latae, gluteus medius, and gluteus minimus muscles, performed once a week for 3 weeks. There were significant improvements in the VAS (MD = 2.1; 95% CI [0.7, 3.5]; p = .004; d = 0.9), hip IR (MD = 10.8; 95% CI [15.4, 6.2]; p = .001; d = 2.0), hip ER (MD = 10.7; 95% CI [14.0, 5.6]; p = .001; d = 2.1), hip flexion (MD = 20.4; 95% CI [27.7, 13.0]; p = .001; d = 2.0), hip abduction (MD = 6.7.8; 95% CI [9.5, 4.0]; p = .001; d = 1.8), hip adduction (MD = 5.5; 95% CI [7.4, 3.6]; p = .001; d = 2.0), hip extension (MD = 14.0; 95% CI [18.7, 9.5]; p = .001; d = 2.4), 20-m walk test (MD = 2.8; 95% CI [1.2, 4.4]; p = .001; d = 1.2), and 30-s chair-stand test (MD = 4.6; 95% CI [7.5, 1.6]; p = .003; d = 1.1). A secondary analysis by Cebellos-Laita et al.[14] evaluated the pain intensity (VAS 0–100) and pain pressure threshold (kg/cm^2) for the iliopsoas, rectus femoris, tensor fasciae latae, and gluteus minimus muscles; psychological distress (Hospital Anxiety and Depression Scale); and self-reported improvement (Global Rate of Change scale). The DN treatment resulted in significant (p < .05) improvements over sham DN for the Group × Time interaction for all variables. Specifically, the DN group showed a greater decrease in pain intensity (Δ −38.7; 95% CI [−49.6, −27.8]), increase in pain pressure threshold (range: Δ 184.3–259; 95% CI [26, 544]), and greater decrease in the Hospital Anxiety and Depression Scale (Δ −5.0; 95% CI [−7.9, −2.0]) when compared to sham DN with a large effect size (d > 0.8) for all three outcomes.

An RCT by Cebellos-Laita et al.[12] investigated the short-term effects of DN (n = 15; M_{age} = 57.53 ± 3.88 years; nine women, six men) to sham DN (n = 15; M_{age} = 58.20 ± 5.08 years; nine women, six men) or a control group (n = 15; M_{age} = 54.67 ± 4.48 years; seven women, eight men) who received no intervention. The participants had either a grade of II or III using the K-L classification of hip OA. Outcomes included Pain (VAS 0–10), (WOMAC) Pain (0–20), and Physical Function (0–68) subscales; the TUG test and the 40-m self-paced walk test; and hip muscle strength. The DN group treatment included a fast-in fast-out technique using a 0.25 × 50 mm needle into active MTrPs in the iliopsoas, rectus femoris, tensor fasciae latae, and gluteus minimus muscles, performed once a week for 3 weeks. Two-way analysis of variance and post hoc analysis showed significant Group × Time interactions with improvements supporting DN treatment over the other groups for intensity of pain after physical function tests (F(2, 42) = 3.879; p = .028, d = 1.38), WOMAC-Pain (F(2, 42) = 0.361; p < .001, d = 1.86), WOMAC-Physical Function (F(2, 42) = 42; p < .001, d = 1.90), TUG (F(2, 42) = 22.427; p < .001, d = 1.29), and 40-meter self-paced walk test (F(2, 42) = 29.808; p < .001, d = 1.22). The analysis also supported DN treatment over the other groups for increasing muscle strength of the hip flexors (F(2, 42) = 29.917; p = .001, d = 2.54), extensors (F(2, 42) = 10.213; p = .001, d = 1.33), abductors (F(2, 42) = 13.015; p < .001, d = 1.84), internal rotators (F(2, 42) = 40.751; p < .001, d = 1.47), and external rotators (F(2, 42) = 13.283; p < .001, d = 1.42). There were no differences between the sham DN and control groups.

Evidence Synthesis

There were four high-quality RCTs and one a secondary analysis that supported the use of DN to treat MTrPs associated with hip OA (grade of II or III). In the short term (3 weeks), DN was shown to improve muscle extensibility, pain, ROM, function, and muscle force production. DN sessions were performed once a week for 3 weeks, with treatment being directed to an MTrP in the iliopsoas, rectus femoris, tensor fasciae latae, gluteus medius, and gluteus minimus muscles using a fast-in fast-out technique. Three studies included DN compared to a sham DN group, while one study compared DN to self-stretching. No adverse events were reported in any of the studies.

Gaps in Knowledge

Further research is needed to determine the long-term effects of DN on muscle extensibility, pain, ROM, function, and muscle force production. Additional research should also explore the effectiveness of DN when used in combination with other physical therapy interventions, such as exercise, rather than as a standalone treatment.

2025 Recommendation

A Clinicians should use DN to treat MTrP in the iliopsoas, rectus femoris, tensor fasciae latae, gluteus medius, and gluteus minimus muscles for short-term (3 weeks) improvements in muscle extensibility, pain, ROM, function, and muscle force production, in those with Grades II and III hip OA.

PATIENT EDUCATION

2017 Recommendation

B Clinicians should provide patient education combined with exercise and/or manual therapy. Education should include teaching activity modification, exercise, supporting weight reduction when overweight, and methods of unloading the arthritic joints.

Evidence Update

I An RCT by Bennell et al.[3] investigated the effects of automated internet-based pain coping skills training, education about hip OA, and exercise program (n = 73; M_{age} = 61.2 ± 7.2 years; 45 women, 28 men) and education about hip OA and exercise (n = 71; M_{age} = 61.3 ± 7.1 years; 37 women, 34 men). The primary outcomes were average pain with walking and the WOMAC Function subscale. The secondary outcomes were Assessment of Quality of Life II; Coping Strategies Questionnaire; Pain Catastrophizing Scale; Depression, Anxiety, and Stress Subscales; and Physical Activity Scale for the Elderly. Participants in the control group received a link to online educational material during the first 8 weeks. Between Weeks 8 and 24, participants performed a home exercise program 3 times per week and addended five face-to-face 30-min individual sessions with a physical therapist. The intervention group received the same online educational material and physical therapist–guided home-based exercise program. In addition, the intervention group received access to an automated internet-based pain coping skills training program during Weeks 1–8, before beginning the exercise program. Between Weeks 8 and 24, the participants were asked to complete the eight 35- to 45-min modules at a rate of once per week and to practice skills daily. There was a significantly higher frequency of the use of pain coping skills in the automated internet-based pain coping skills training group at Week 8 (MD = 11.5; 95% CI [5.3, 19.7]), at Week 24 (MD = 11.7; 95% CI [2.9, 20.5]), and at Week 52 (MD = 15.3; 95% CI [4.4, 26.2]) when compared to the control group. There was a significant improvement in WOMAC-Function favoring the automated internet-based pain coping skills training group (MD = 23.2 units; 95% CI [26.2, 20.1]) at Week 8. Favoring the automated internet-based pain coping skills training group, there was a significant improvement in overall pain and function (odds ratio [*OR*] = 3.31; 95% CI [1.02, 10.78]; p = .04), pain (*OR* = 6.93; 95% CI [1.75, 27.49]; p = .009), and function (*OR* = 8.41; 95% CI [2.30, 30.74]; p = .002) at 8 weeks, but not at 24 or 52 weeks. There were no significant differences for all secondary outcomes between the two groups at 8, 24, or 52 weeks. The automated internet-based skills training group immediately improved pain coping and perceived function but did not add additional benefits to a subsequent exercise program, despite sustained pain coping improvements for individuals.

Evidence Synthesis

There was one high-quality RCT that supported the combination of education about hip OA and automated internet-based pain coping skills training after 8 weeks to improve average pain, function, QOL, depression, anxiety, and stress levels but did not confer additional benefits to a subsequent exercise program, despite sustained pain coping improvements.

Gaps in Knowledge

Research on the use of patient education is limited since the 2017 revision.

2025 Recommendation

B Clinicians should provide patient education on activity modification, exercise, supporting weight reduction when overweight, and methods of unloading the arthritic joints, as well as internet-based pain coping skills training combined with exercise and/or manual therapy.

WEIGHT LOSS

2017 Recommendation

C In addition to providing exercise intervention, clinicians should collaborate with physicians, nutritionists, or dietitians to support weight reduction in individuals with hip OA who are overweight or obese.

Evidence Update

I An SR of 11 clinical practice guidelines by Lim et al.[39] explored recommendations for weight management. In reference to the hip OA–targeted group for weight loss, there were three guidelines that recommended weight loss for people who have a BMI greater than 30 kg/m^2. One of these three guidelines targeted weight loss for those people who did not have comorbid conditions that included gastrointestinal or cardiovascular conditions, widespread pain, and/or depression. In reference to the weight loss strategies, seven guidelines described a general, nonspecific weight loss strategy that consisted of a combination of dietary and/or concurrent exercise. In reference to the magnitude of

weight loss, two guidelines recommend a weight loss target of 5%–7.5% for those with BMI greater than 25 kg/m^2. In conclusion, this study supported the recommendation for weight loss for people who are overweight or obese with hip OA.

Evidence Synthesis

There was one SR that supported the recommendation for weight loss (5%–7.5%) for people who are overweight or obese with hip OA.

Gaps in Knowledge

Research on the use of weight loss for patients with hip OA is limited since the 2017 revision. There is not enough evidence to support a change in the recommendation.

2025 Recommendation

B

In addition to providing exercise intervention, clinicians should collaborate with physicians, nutritionists, or dietitians to support weight reduction in individuals with hip OA who are overweight or obese.

FUNCTIONAL, GAIT, AND BALANCE TRAINING

2017 Recommendations

C

Clinicians should provide impairment-based functional, gait, and balance training, including the proper use of assistive devices (canes, crutches, walkers), to patients with hip OA and activity limitations, balance impairment, and/or gait limitations when associated problems are observed and documented during the history or physical assessment of the patient.

C

Clinicians should individualize prescription of therapeutic activities based on the patient's values, daily life participation, and functional activity needs.

Evidence Update

No studies investigated the effectiveness of functional, gait, and/or balance training. Therefore, the recommendations are unchanged.

2025 Recommendations

C

Clinicians should provide impairment-based functional, gait, and balance training, including the proper use of assistive devices (canes, crutches, walkers), to patients with hip OA and activity limitations, balance impairment, and/or gait limitations when associated problems are observed and documented during the history or physical assessment of the patient.

C

Clinicians should individualize prescription of therapeutic activities based on the patient's values, daily life participation, and functional activity needs.

MODALITIES

Ultrasound

2017 Recommendation

B

Clinicians may use US (1 MHz; 1 W/cm^2 for 5 min each to the anterior, lateral, and posterior hip for a total of 10 treatments over a 2-week period) in addition to exercise and hot packs in the short-term management of pain and activity limitation in individuals with hip OA.

Evidence Update

Ultrasound

I

An RCT by Király et al.[30] investigated the effects among (a) continuous US at 3 MHz frequency, 1.5 W/cm^2 intensity (n = 21; M_{age} = 67.95 ± 7.74 years; 17 women, four men); (b) pulsed US at 1.5 W/cm^2 intensity, 3 MHz frequency, 50% duty cycle (n = 17; M_{age} = 65.82 ± 10.45 years; 13 women, four men); (c) US at continuous US: 0.5 W/cm^2 intensity, 3 MHz frequency combined with electrical stimulation at 100 Hz frequency, 100 μs impulse, constant frequency (n = 15; M_{age} = 65.93 ± 9.12 years; 13 women, two men); and (d) placebo US (n = 18; M_{age} = 65.72 ± 8.77 years; 14 women, four men,) on hip pain VAS (0–100 mm), functional impairment WOMAC, 6MWT, and QOL (SF-36). The US treatment areas included three regions: (a) inguinal, (b) gluteal, and (c) trochanteric for 3 min per field, altogether for 9 min, every day for 2 weeks for 10 total sessions in subjects with moderate hip OA. All groups received conventional physical therapy management consisting of exercise, massage, and balneotherapy. After each follow-up visit at Weeks 2 and 14, there were no significant differences between any of the groups for any of the outcomes.

Evidence Synthesis

Since 2017, there has been one high-quality RCT compared continuous US, pulsed US, continuous US with electrical stimulation, and placebo US. This study found no differences in pain or function between treatments and therefore did not support the use of US over 14 weeks when added to conventional therapy for patients with moderate hip OA (K-L Stages II–III). These results are in conflict with prior recommendations that supported 10 US treatments over a 2-week period. No adverse events were reported for these treatments.

Gaps in Knowledge

More research is needed to study the use of US and other modalities with a variety of parameters.

2025 Recommendations

D

Therapeutic US may be added to conventional physical therapy in the context of shared decision making; however, patients should be informed of the conflicting evidence on its efficacy for hip OA and any potential costs.

BRACING

2017 Recommendation

F

Clinicians should not use bracing as a first line of treatment. A brace may be used after exercise or manual therapies are unsuccessful in improving participation in activities that require turning/pivoting for patients with mild-to-moderate hip OA, especially in those with bilateral hip OA.

Evidence Update

No studies investigated the effectiveness of bracing. Therefore, the recommendation is unchanged.

2025 Recommendation

F

Clinicians should not use bracing as a first line of treatment. A brace may be used after exercise or manual therapies are unsuccessful in improving participation in activities that require turning/pivoting for patients with mild-to-moderate hip OA, especially in those with bilateral hip OA.

ANTI-INFLAMMATORY AGENTS

2017 Summary

Nonsteroidal anti-inflammatory drugs (NSAIDs), COX-2 (cyclooxygenase-2) inhibitors, and steroid injections are effective treatments for relief of symptoms in patients with hip OA. Some evidence suggests that NSAIDs may increase the progression of hip OA by decreasing glycosaminoglycan synthesis; however, data are not conclusive. Clinicians should be aware of the incidence of serious gastrointestinal side effects associated with the use of oral NSAIDs.

2025 Update

The authors have no new comments to make on anti-inflammatory agents since the 2017 revision.

ALTERNATIVE/COMPLEMENTARY TREATMENT

2017 Summary

There is insufficient evidence to support the use of supplements such as glucosamine, chondroitin, hyaluronic acid (injectable), or similar substances for the treatment of hip OA.

Evidence Update

II

An RCT by Kovács et al.[33] investigated the effects of sulfur baths (balneotherapy) and exercise (n = 22; M_{age} = ±59.14 ± 7.55 years) to exercise alone (n = 22; M_{age} = 60.66 ± 7.6 years). Outcome measures included the WOMAC (pain, stiffness, functional limitation, and total score), EuroQol-5D, and VAS (0–100). The balneotherapy group sat in sulfur mineral water for 20 min over 15 sessions at a water temperature of 36°C (96.8°F). The hip exercises were performed by both groups daily for 3 weeks. Outcome data were collected at 3 and 12 weeks. The balneotherapy and exercise group showed greater improvements in WOMAC-Pain (p = .041), WOMAC-Stiffness (p = .001), WOMAC-Functional Limitation (p = .03), WOMAC total score (p = .018), and VAS scores (p = .026) at 12 weeks. There were no differences between the groups for the EuroQol-5D at 3 or 12 weeks. No adverse effects were noted.

2025 UPDATE

The authors have no new comments to make on alternative/complementary medications since the 2017 revision. Further evidence is needed to investigate the benefits of balneotherapy (**FIGURE 1**).

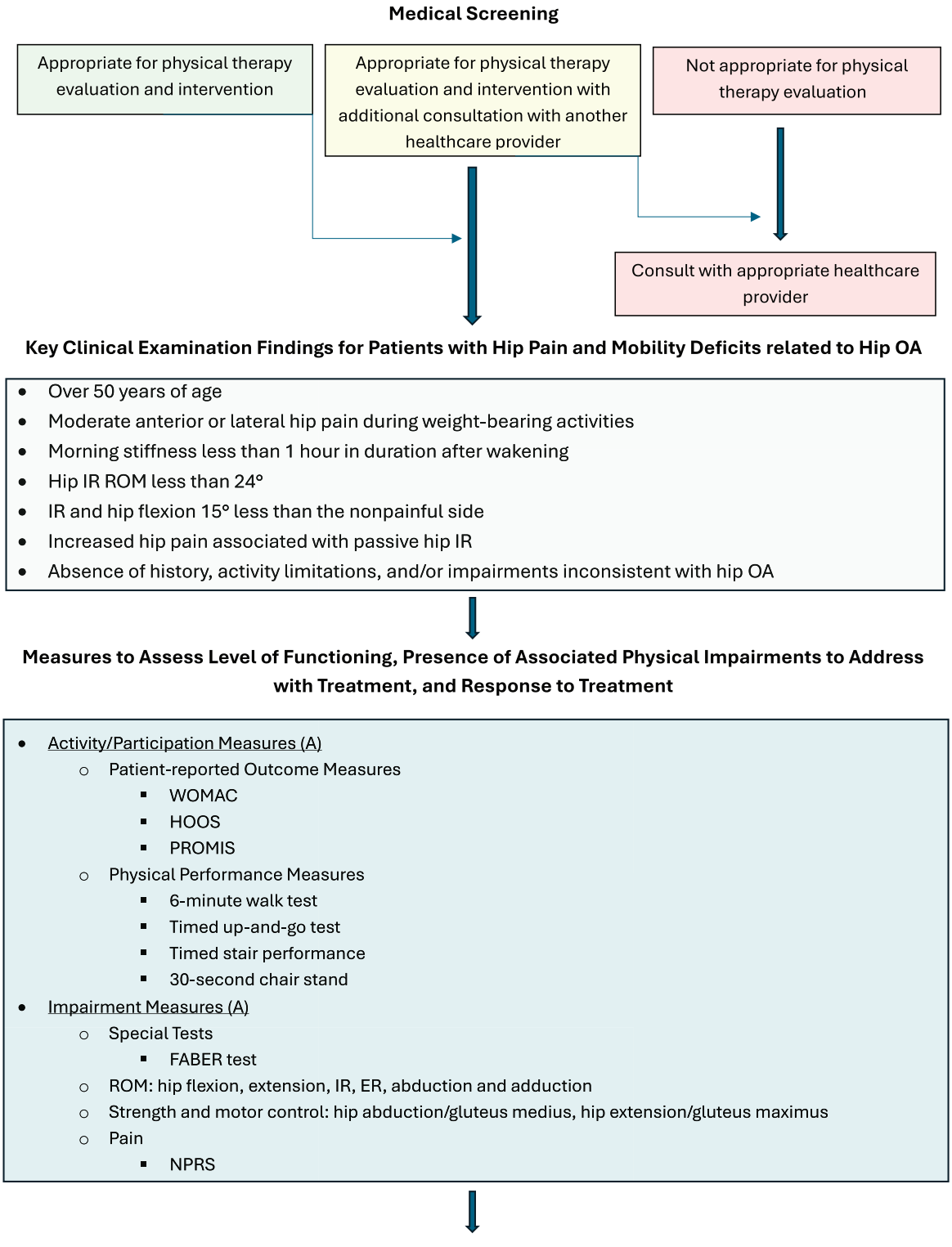
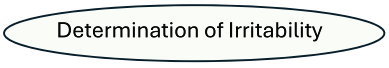


FIGURE 1. Hip Osteoarthritis Clinical Practice Guideline recommendation diagram.



Interventions

Note: Interventions should be tailored to address the specific hip OA-related impairments and limitations identified on examination.

- Flexibility, Strengthening, and Endurance Exercises (A)
  - Dosage: 1 to 5 times per week, 30-120 minutes per session, over 5 to 16 weeks for mild to moderate hip OA
  - Hip capsule, fascia, and muscle stretching, including extension, flexion, IR, ER, abduction, and horizontal adduction, with attention to hip flexors and ERs
  - Strengthening of hip abductors, ERs, extensors
- Manual Therapy (A)
  - Soft tissue mobilization of areas of soft tissue restriction, such as iliacus, hip ERs, posterior gluteus medius, quadratus femoris, and gluteus maximus muscles
  - Joint mobilizations to improve identified restrictions in joint mobility, such as high and low force hip distraction mobilizations, posterior glides, anterior glides, and distraction mobilizations with movement
- Dry Needling (A)
  - DN to MTrP in the iliopsoas, rectus femoris, tensor fasciae latae, gluteus medius, and gluteus minimus muscles for short-term to improve muscle extensibility, pain, ROM, function, muscle force production and pain reduction.
- Patient Education Combined with Exercise and/or Manual Therapy (B)
  - Address weight-bearing activity modification as appropriate
  - Provide exercises to address identified impairments and to support weight reduction as appropriate
  - Discuss unloading the arthritic joints as appropriate
  - Consider internet-based coping skills training as indicated by patient preference
- Weight Loss (B)
  - Refer and collaborate as needed to physicians, nutritionists, or dietitians to support weight management plan
- Functional, Gait, and Balance Training (C)
  - Provide impairment-based, individualized functional, gait, and balance training, including the proper use of assistive devices (canes, crutches, walkers) as indicated by clinical assessment
- Modalities (D)
  - A recommendation to add ultrasound to conventional physical therapy for those with hip OA cannot be made.
- Bracing (F)
  - Should not be used as a first line of treatment

Revise Diagnosis, Change Plan of Care, or Refer to Appropriate Clinicians

- When the patient's symptoms do not diminish after targeted interventions within expected time frame, as identified in the tailored treatment plan

FIGURE 1. Continued.

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REFERENCES

1. Altman R, Alarcón G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. *Arthritis Rheum*. 1991;34:505–514. https://doi.org/10.1002/art.1780340502
2. American College of Radiology. ACR Appropriateness Criteria. Accessed June 15, 2025. https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria
3. Bennell KL, Nelligan RK, Rini C, et al. Effects of internet-based pain coping skills training before home exercise for individuals with hip osteoarthritis (HOPE trial): a randomised controlled trial. *Pain*. 2018;159:1833–1842. https://doi.org/10.1097/j.pain.0000000000001281
4. Beselga C, Neto F, Alburquerque-Sendín F, Hall T, Oliveira-Campelo N. Immediate effects of hip mobilization with movement in patients with hip osteoarthritis: a randomised controlled trial. *Man Ther*. 2016;22:80–85. https://doi.org/10.1016/j.math.2015.10.007
5. Bieler T, Kristensen ALR, Nyberg M, Magnusson SP, Kjaer M, Beyer N. Exercise in patients with hip osteoarthritis – effects on muscle and functional performance: a randomized trial. *Physiother Theory Pract*. 2022;38:1946–1957. https://doi.org/10.1080/09593985.2021.1923096
6. Bieler T, Siersma V, Magnusson SP, Kjaer M, Beyer N. Exercise induced effects on muscle function and range of motion in patients with hip osteoarthritis. *Physiother Res Int*. 2018;23. https://doi.org/10.1002/pri.1697
7. Bieler T, Siersma V, Magnusson SP, Kjaer M, Christensen HE, Beyer N. In hip osteoarthritis, Nordic Walking is superior to strength training and home-based exercise for improving function. *Scand J Med Sci Sports*. 2017;27:873–886. https://doi.org/10.1111/sms.12694
8. Bierma-Zeinstra S, Bohnen A, Ginai A, Prins A, Verhaar J. Validity of American College of Rheumatology criteria for diagnosing hip osteoarthritis in primary care research. *J Rheumatol*. 1999;26:1129–1133.
9. Birrell F, Croft P, Cooper C, Hosie G, Macfarlane G, Silman A. Predicting radiographic hip osteoarthritis from range of movement. *Rheumatology (Oxford)*. 2001;40:506–512. https://doi.org/10.1093/rheumatology/40.5.506
10. Ceballos-Laita L, Estébanez-de-Miguel E, Martín-Nieto G, Bueno-Gracia E, Fortún-Agúd M, Jiménez-del-Barrio S. Effects of non-pharmacological conservative treatment on pain, range of motion and physical function in patients with mild to moderate hip osteoarthritis. A systematic review. *Complement Ther Med*. 2019;42:214–222. https://doi.org/10.1016/j.ctim.2018.11.021
11. Ceballos-Laita L, Jiménez-del-Barrio S, Marín-Zurdo J, et al. Comparison of dry needling and self-stretching in muscle extensibility, pain, stiffness, and physical function in hip osteoarthritis: a randomized controlled trial. *Complement Ther Clin Pract*. 2022;49:101667. https://doi.org/10.1016/j.ctcp.2022.101667
12. Ceballos-Laita L, Jiménez-Del-Barrio S, Marín-Zurdo J, et al. Effectiveness of dry needling therapy on pain, hip muscle strength, and physical function in patients with hip osteoarthritis: a randomized controlled trial. *Arch Phys Med Rehabil*. 2021;102:959–966. https://doi.org/10.1016/j.apmr.2021.01.077
13. Ceballos-Laita L, Jiménez-Del-Barrio S, Marín-Zurdo J, et al. Effects of dry needling in HIP muscles in patients with HIP osteoarthritis: a randomized controlled trial. *Musculoskelet Sci Pract*. 2019;43:76–82. https://doi.org/10.1016/j.msksp.2019.07.006
14. Ceballos-Laita L, Jiménez-Del-Barrio S, Marín-Zurdo J, et al. Effects of dry needling on pain, pressure pain threshold and psychological distress in patients with mild to moderate hip osteoarthritis: secondary analysis of a randomized controlled trial. *Complement Ther Med*. 2020;51:102443. https://doi.org/10.1016/j.ctim.2020.102443
15. Cibulka MT, White DM, Woehrle J, et al. Hip pain and mobility deficits—hip osteoarthritis: clinical practice guidelines linked to the international classification of functioning, disability, and health from the orthopaedic section of the American Physical Therapy Association. *J Orthop Sports Phys Ther*. 2009;39:A1–25. https://doi.org/10.2519/jospt.2009.0301
16. Estébanez-de-Miguel E, Fortún-Agud M, Jimenez-del-Barrio S, Caudevilla-Polo S, Bueno-Gracia E, Tricás-Moreno JM. Comparison of high, medium and low mobilization forces for increasing range of motion in patients with hip osteoarthritis: a randomized controlled trial. *Musculoskelet Sci Pract*. 2018;36:81–86. https://doi.org/10.1016/j.msksp.2018.05.004
17. Estébanez-de-Miguel E, Jimenez-del-Barrio S, Fortún- Agud M, et al. Comparison of high, medium and low mobilization forces for reducing pain and improving physical function in patients with hip osteoarthritis: secondary analysis of a randomized controlled trial. *Musculoskelet Sci Pract*. 2019;41:43–48. https://doi.org/10.1016/j.msksp.2019.03.007
18. Fan Z, Yan L, Liu H, et al. The prevalence of hip osteoarthritis: a systematic review and meta-analysis. *Arthritis Res Ther*. 2023;25:51. https://doi.org/10.1186/s13075-023-03033-7
19. Fukumoto Y, Tateuchi H, Tsukagoshi R, et al. Effects of high- and low-velocity resistance training on gait kinematics and kinetics in individuals with hip osteoarthritis: a randomized controlled trial. *Am J Phys Med Rehabil*. 2017;96:417–423. https://doi.org/10.1097/PHM.0000000000000640
20. Ganz R, Leunig M, Leunig-Ganz K, Harris WH. The etiology of osteoarthritis of the hip: an integrated mechanical concept. *Clin Orthop Relat Res*. 2008;466:264–272. https://doi.org/10.1007/s11999-007-0060-z
21. Geigle PR, Van Wingerden A, Biondi M, et al. Exercise in the aquatic environment for people with primary hip osteoarthritis: a systematic review and meta-analyses. *J Aqua Phys Ther*. 2022;30:44–57.
22. George S, Fritz J, Silfies S, et al. Interventions for the management of acute and chronic low back pain: revision 2021. *J Orthop Sports Phys Ther*. 2021;51:CPG1–CPG60. https://doi.org/10.2519/jospt.2021.0304
23. Giori NJ, Trousdale RT. Acetabular retroversion is associated with osteoarthritis of the hip. *Clin Orthop Relat Res*. 2003;263–269. https://doi.org/10.1097/01.blo.0000093014.90435.64
24. James KA, von Heideken J, Iversen MD. *Reporting of Adverse Events in Randomized Controlled Trials of Therapeutic Exercise for Hip Osteoarthritis: A Systematic Review*. Oxford University Press; 2021.
25. Josipovic P, Moharc M, Sironic F, Salamon D, Vidmar G, Šarabon N. Effects of device-performed and manual hip traction and vibration therapy in older adults with symptomatic hip osteoarthritis: a randomized single-blind controlled trial. *J Back Musculoskelet Rehabil*. 2024;37:213–224. https://doi.org/10.3233/BMR-230109
26. Khan AM, McLoughlin E, Giannakas K, Hutchinson C, Andrew JG. Hip osteoarthritis: where is the pain? *Ann R Coll Surg Engl*. 2004;86:119–121. https://doi.org/10.1308/003588404322827518
27. Kim BI, Wixted CM, Wu CJ, Hinton ZW, Jiranek WA. Inertial sensor gait analysis of trendelenburg gait in patients who have hip osteoarthritis. *J Arthroplasty*. 2024;39:1741–1746. https://doi.org/10.1016/j.arth.2024.01.036
28. Kim C, Linsenmeyer KD, Vlad SC, et al. Prevalence of radiographic and symptomatic hip osteoarthritis in an urban United States community: the Framingham osteoarthritis study. *Arthritis Rheumatol*. 2014;66:3013–3017. https://doi.org/10.1002/art.38795
29. Kim WY, Hutchinson CE, Andrew JG, Allen PD. The relationship between acetabular retroversion and osteoarthritis of the hip. *J Bone Joint Surg Br*. 2006;88:727–729. https://doi.org/10.1302/0301-620X.88B6.17430

30. Király M, Gömöri E, Kiss R, et al. *Effects of various Types of Ultrasound Therapy in Hip Osteoarthritis - A Double-Blind, Randomized, Controlled, Follow-Up Study*. Taylor & Francis; 2022.
31. Koc TA, Bise CG, Neville C, Carreira D, Martin RL, McDonough CM. Heel pain - plantar fasciitis: revision 2023. *J Orthop Sports Phys Ther*. 2023;53:CPG1–CPG39. https://doi.org/10.2519/jospt.2023.0303
32. Kohn MD, Sassoon AA, Fernando ND. Classifications in brief: Kellgren-Lawrence Classification of Osteoarthritis. *Clin Orthop Relat Res*. 2016;474:1886–1893. https://doi.org/10.1007/s11999-016-4732-4
33. Kovács C, Bozsik Á, Pecze M, et al. Effects of sulfur bath on hip osteoarthritis: a randomized, controlled, single-blind, follow-up trial: a pilot study. *Int J Biometeorol*. 2016;60:1675–1680. https://doi.org/10.1007/s00484-016-1158-3
34. Kovalenko B, Bremjit P, Fernando N. Classifications in brief: Tönnis Classification of Hip Osteoarthritis. *Clin Orthop Relat Res*. 2018;476:1680–1684. https://doi.org/10.1097/01.blo.0000534679.75870.5f
35. Kowalczuk, Yeung, Simunovic, Ayeni. Does femoroacetabular impingement contribute to the development of hip osteoarthritis? A systematic review. *Sports Med Arthrosc*. 2015;23:174–179. https://doi.org/10.1097/JSA.0000000000000091
36. Krauss I, Hein T, Steinhilber B, Janßen P. A 12-week exercise program for patients with hip osteoarthritis has no influence on gait parameters: a secondary analysis of a randomized controlled trial. *Gait Posture*. 2020;78:6–12. https://doi.org/10.1016/j.gaitpost.2020.03.001
37. Lerch TD, Todorski IAS, Steppacher SD, et al. Prevalence of femoral and acetabular version abnormalities in patients with symptomatic hip disease: A controlled study of 538 hips. *Am J Sports Med*. 2018;46:122–134. https://doi.org/10.1177/0363546517726983
38. Lespasio MJ, Sultan AA, Piuzzi NS, et al. Hip osteoarthritis: a primer. *Perm J*. 2018;22:17–084. https://doi.org/10.7812/TPP/17-084
39. Lim YZ, Wong J, Hussain SM, et al. Recommendations for weight management in osteoarthritis: a systematic review of clinical practice guidelines. *Osteoarthr Cartil Open*. 2022;4:100298. https://doi.org/10.1016/j.ocarto.2022.100298
40. Mabry LM, Severin R, Gisselman AS, et al. Physical therapists are routinely performing the requisite skills to directly refer for musculoskeletal imaging: an observational study. *J Man Manip Ther*. 2022;30:261–272. https://doi.org/10.1080/10669817.2022.2106729
41. MacDonald C. Hip manual therapy for aging and older adults. *Top Geriatr Rehab*. 2015;32:106–113. https://doi.org/10.1097/TGR.0000000000000074
42. Medicine ACoS. *ACSM's Guidelines for Exercise Testing and Prescription. 9th ed*. Lippincott Williams & Wilkins; 2014.
43. Moseng T, Dagfinrud H, Smedslund G, Østerås N. The importance of dose in land-based supervised exercise for people with hip osteoarthritis. A systematic review and meta-analysis. *Osteoarthritis Cartilage*. 2017;25:1563–1576. https://doi.org/10.1016/j.joca.2017.06.004
44. Nicola Di V. Degenerative osteoarthritis a reversible chronic disease. *Regen Ther*. 2020;15:149–160. https://doi.org/10.1016/j.reth.2020.07.007
45. Organization WH. How to Use the ICF: a Practical Manual for using the International Classification of Functioning, Disability and Health (ICF). Exposure Draft for Comment. Geneva, Switzerland: 2013.
46. Pawlowska KM, Bochynski R, Pawlowski J, Jerzak L, Grochulska A. The impact of mobilization on hip osteoarthritis. *J Back Musculoskelet Rehabil*. 2020;33:817–822. https://doi.org/10.3233/BMR-181118
47. Phillips B BC, Sackett S, et al. Oxford Centre for Evidence-based Medicine - Levels of Evidence. Accessed March 2009. http://www.cebm. net/index.aspx?o=1025
48. Poulsen E, Overgaard S, Vestergaard JT, Christensen HW, Hartvigsen J. Pain distribution in primary care patients with hip osteoarthritis. *Fam Pract*. 2016;33:601–606. https://doi.org/10.1093/fampra/cmw071
49. Roesel I, Steinhilber B, Martus P, Janssen P, Krauss I. Secondary analysis of a study on exercise therapy in hip osteoarthritis: follow-up data on pain and physical functioning. *Int J Environ Res Public Health*. 2021;18:8366. https://doi.org/10.3390/ijerph18168366
50. Rostron ZPJ, Zacharias A, Semciw AI, et al. Effects of a targeted resistance intervention compared to a sham intervention on gluteal muscle hypertrophy, fatty infiltration and strength in people with hip osteoarthritis: analysis of secondary outcomes from a randomised clinical trial. *BMC Musculoskelet Disord*. 2022;23:944. https://doi.org/10.1186/s12891-022-05907-4
51. Sampath KK, Mani R, Miyamori T, Tumilty S. The effects of manual therapy or exercise therapy or both in people with hip osteoarthritis: a systematic review and meta-analysis. *Clin Rehabil*. 2016;30:1141–1155. https://doi.org/10.1177/0269215515622670
52. Shepherd MH, Shumway J, Salvatori RT, Rhon DI, Young JL. The influence of manual therapy dosing on outcomes in patients with hip osteoarthritis: a systematic review. *J Man Manip Ther*. 2022;30:315–327. https://doi.org/10.1080/10669817.2022.2037193
53. Short SM, MacDonald CW, Strack D. Hip and groin injury prevention in elite athletes and team sport - current challenges and opportunities. *Int J Sports Phys Ther*. 2021;16:270–281. https://doi.org/10.26603/001c.18705
54. Steinhilber B, Haupt G, Miller R, Janssen P, Krauss I. Exercise therapy in patients with hip osteoarthritis: effect on hip muscle strength and safety aspects of exercise-results of a randomized controlled trial. *Mod Rheumatol*. 2017;27:493–502. https://doi.org/10.1080/14397595.2016.1213940
55. Svege I, Fernandes L, Nordsletten L, Holm I, Risberg MA. Long-term effect of exercise therapy and patient education on impairments and activity limitations in people with hip osteoarthritis: secondary outcome analysis of a randomized clinical trial. *Phys Ther*. 2016;96:818–827. https://doi.org/10.2522/ptj.20140520
56. Teirlinck CH, Verhagen AP, Reijneveld EAE, et al. Responders to exercise therapy in patients with osteoarthritis of the hip: a systematic review and meta-analysis. *Int J Environ Res Public Health*. 2020;17:7380. https://doi.org/10.3390/ijerph17207380
57. Teirlinck CH, Verhagen AP, van Ravesteyn LM, et al. Effect of exercise therapy in patients with hip osteoarthritis: a systematic review and cumulative meta-analysis. *Osteoarthr Cartil Open*. 2023;5:100338. https://doi.org/10.1016/j.ocarto.2023.100338
58. Tonnis D, Heinecke A. Acetabular and femoral anteversion: relationship with osteoarthritis of the hip. *J Bone Joint Surg Am*. 1999;81:1747–1770. https://doi.org/10.2106/00004623-199912000-00014
59. Youdas JW, Madson TJ, Hollman JH. Usefulness of the Trendelenburg test for identification of patients with hip joint osteoarthritis. *Physiother Theory Pract*. 2010;26:184–194. https://doi.org/10.3109/09593980902750857
60. Zacharias A, Pizzari T, English DJ, Kapakoulakis T, Green RA. Hip abductor muscle volume in hip osteoarthritis and matched controls. *Osteoarthritis Cartilage*. 2016;24:1727–1735. https://doi.org/10.1016/j.joca.2016.05.002
61. Zhang C, Li L, Forster BB, et al. Femoroacetabular impingement and osteoarthritis of the hip. *Can Fam Physician*. 2015;61:1055–1060.

APPENDIX A

SEARCH STRATEGIES AND SEARCH RESULTS

Run January 14, 2024
Total Number of Search Results: 4,256
Number of Original Search Results: 3,136
Updated October 25, 2024
Total Number of Search Results: 4,781
Number of New Original Search Results: 313
Total Number of Original Search Results: 3,449

PubMed via the National Library of Medicine

#	Search Terms	Results
1 - Interventions	("Combined Modality Therapy"[mesh] OR "Electric Stimulation Therapy"[mesh] OR "Electric Stimulation"[mesh] OR "Transcutaneous Electric Nerve Stimulation"[mesh] OR Traction[mesh] OR "Laser Therapy"[mesh] OR Rehabilitation[mesh] OR rehabilitation[Subheading] OR Phototherapy[mesh] OR Lasers[mesh] OR "Physical Therapy Modalities"[mesh] OR Cryotherapy[mesh] OR Cryoanesthesia[mesh] OR Ice[mesh] OR "Acupuncture Therapy"[mesh] OR Acupuncture[mesh] OR modalit*[tiab] OR "electric stimulation"[tiab] OR "electrical stimulation"[tiab] OR electrotherapy[tiab] OR tens[tiab] OR "transcutaneous electric nerve stimulation"[tiab] OR electroacupuncture[tiab] OR acupuncture[tiab] OR needling[tiab] OR heat[tiab] OR cold[tiab] OR traction[tiab] OR laser[tiab] OR lasers[tiab] OR rehabilitation[tiab] OR "physical therapy"[tiab] OR "physical therapies"[tiab] OR physiotherap*[tiab] OR cryotherapy[tiab] OR hyperthermia[tiab] OR "vapocoolant spray"[tiab] OR cryoanesthesia[tiab] OR ice[tiab] OR faradic[tiab] OR traction[tiab] OR iontophoresis[tiab] OR phonophoresis[tiab] OR phototherapy[tiab] OR hydrotherapy[tiab] OR "light therapy"[tiab] OR diathermy[tiab] OR ultraviolet[tiab] OR infrared[tiab]) OR ("Exercise Therapy"[Mesh] OR Exercise[mesh] OR "Self-Help Devices"[Mesh] OR "education"[Subheading] OR "Patient Education as Topic"[Mesh] OR crutches[Mesh] OR Canes[Mesh] OR Walkers[Mesh] OR "orthotic devices"[mesh] OR "therapy"[Subheading] OR exercis*[tiab] OR massag*[tiab] OR "manual therapy"[tiab] OR accupressure[tiab] OR manipulat*[tiab] OR "applied kinesiology"[tiab] OR stretching[tiab] OR stretch[tiab] OR stretches[tiab] OR "continuous passive movement"[tiab] OR "continuous passive motion"[tiab] OR plyometric[tiab] OR plyometrics[tiab] OR "resistance training"[tiab] OR "strength training"[tiab] OR strengthening[tiab] OR "weight-bearing"[tiab] OR weightbearing[tiab] OR "weight-lifting"[tiab] OR weightlifting[tiab] OR "physical conditioning"[tiab] OR education[tiab] OR balneotherapy[tiab] OR "aquatic therapy"[tiab] OR "pool therapy"[tiab] OR "water aerobics"[tiab] OR "water running"[tiab] OR "water training"[tiab] OR "gait aids"[tiab] OR "gait aid"[tiab] OR "gait training"[tiab] OR crutches[tiab] OR walker[tiab] OR walkers[tiab] OR cane[tiab] OR canes[tiab] OR orthotic*[tiab] OR orthoses[tiab] OR orthosis[tiab] OR "activity modification"[tiab] OR "balance training"[tiab] OR "functional training"[tiab] OR "assistive devices"[tiab] OR "assistive device"[tiab] OR mobilization[tiab] OR mobilisation[tiab] OR "flexibility training"[tiab] OR "endurance training"[tiab] OR "proprioceptive neuromuscular facilitation"[tiab] OR "manual resistance"[tiab] OR "aerobic activity"[tiab]) OR ("Trigger Points"[Mesh] OR "Blood Flow Restriction Therapy"[Mesh] OR "Dry Needling"[Mesh] OR "trigger point*"[tiab] OR "trigger area*"[tiab] OR "blood flow restriction"[tiab] OR "BFR therapy"[tiab] OR "dry needling"[tiab])	11,302,583
2 – Hip OA	("osteoarthritis, hip"[mesh] OR "hip osteoarthr*"[tw] OR "hip osteoarthritis"[Title/Abstract:~3] OR "hips osteoarthritis"[Title/Abstract:~3]) OR ((hip[majr] OR "hip joint"[majr]) AND (osteoarthritis[majr:noexp]))	15,636
3 - Combined	1 AND 2	10,758
4 - Filters	#3 AND ("2016"[Date - Publication] : "3000"[Date - Publication]) NOT ("Comment"[Publication Type] OR "Editorial"[Publication Type] OR "Letter"[Publication Type] OR "Newspaper Article"[Publication Type] OR "Retracted Publication"[Publication Type] OR "Case Reports"[Publication Type] OR "Case Report"[ti] OR "Retrospective Studies"[Mesh]) NOT ("Pediatrics"[Mesh] OR "Child"[Mesh] OR "Child, Preschool"[Mesh])	2,608

Table continues on next page.

APPENDIX A (CONTINUED)

Cochrane Library via Wiley

#	Search Terms	Results
1 - Interventions	([mh "Combined Modality Therapy"] OR [mh "Electric Stimulation Therapy"] OR [mh "Electric Stimulation"] OR [mh "Transcutaneous Electric Nerve Stimulation"] OR [mh Traction] OR [mh "Laser Therapy"] OR [mh Rehabilitation] OR [mh /RH] OR [mh Phototherapy] OR [mh Lasers] OR [mh "Physical Therapy Modalities"] OR [mh Cryotherapy] OR [mh Cryoanesthesia] OR [mh Ice] OR [mh "Acupuncture Therapy"] OR [mh Acupuncture] OR modalit*:ti,ab OR "electric stimulation":ti,ab OR "electrical stimulation":ti,ab OR electrotherapy:ti,ab OR tens:ti,ab OR "transcutaneous electric nerve stimulation":ti,ab OR electroacupuncture:ti,ab OR acupuncture:ti,ab OR needling:ti,ab OR heat:ti,ab OR cold:ti,ab OR traction:ti,ab OR laser:ti,ab OR lasers:ti,ab OR rehabilitation:ti,ab OR "physical therapy":ti,ab OR "physical therapies":ti,ab OR physiotherap*:ti,ab OR cryotherapy:ti,ab OR hyperthermia:ti,ab OR "vapocoolant spray":ti,ab OR cryoanesthesia:ti,ab OR ice:ti,ab OR faradic:ti,ab OR traction:ti,ab OR iontophoresis:ti,ab OR phonophoresis:ti,ab OR phototherapy:ti,ab OR hydrotherapy:ti,ab OR "light therapy":ti,ab OR diathermy:ti,ab OR ultraviolet:ti,ab OR infrared:ti,ab) OR ([mh "Exercise Therapy"] OR [mh Exercise] OR [mh "Self-Help Devices"] OR [mh "Patient Education as Topic"] OR [mh crutches] OR [mh Canes] OR [mh Walkers] OR [mh "orthotic devices"] OR exercis*:ti,ab OR massag*:ti,ab OR "manual therapy":ti,ab OR accupressure:ti,ab OR manipulat*:ti,ab OR "applied kinesiology":ti,ab OR stretching:ti,ab OR stretch:ti,ab OR stretches:ti,ab OR "continuous passive movement":ti,ab OR "continuous passive motion":ti,ab OR plyometric:ti,ab OR plyometrics:ti,ab OR "resistance training":ti,ab OR "strength training":ti,ab OR strengthening:ti,ab OR weight-bearing:ti,ab OR weightbearing:ti,ab OR weight-lifting:ti,ab OR weightlifting:ti,ab OR "physical conditioning":ti,ab OR education:ti,ab OR balneotherapy:ti,ab OR "aquatic therapy":ti,ab OR "pool therapy":ti,ab OR "water aerobics":ti,ab OR "water running":ti,ab OR "water training":ti,ab OR "gait aids":ti,ab OR "gait aid":ti,ab OR "gait training":ti,ab OR crutches:ti,ab OR walker:ti,ab OR walkers:ti,ab OR cane:ti,ab OR canes:ti,ab OR orthotic*:ti,ab OR orthoses:ti,ab OR orthosis:ti,ab OR "activity modification":ti,ab OR "balance training":ti,ab OR "functional training":ti,ab OR "assistive devices":ti,ab OR "assistive device":ti,ab OR mobilization:ti,ab OR mobilisation:ti,ab OR "flexibility training":ti,ab OR "endurance training":ti,ab OR "proprioceptive neuromuscular facilitation":ti,ab OR "manual resistance":ti,ab OR "aerobic activity":ti,ab) OR ([mh "Trigger Points"] OR [mh "Blood Flow Restriction Therapy"] OR [mh "Dry Needling"] OR ("trigger" NEXT point*):ti,ab OR ("trigger" NEXT area*):ti,ab OR "blood flow restriction":ti,ab OR "BFR therapy":ti,ab OR "dry needling":ti,ab)	438,139
2 – Hip OA	[mh "osteoarthritis, hip"] OR ("hip" NEXT osteoarthr*):ti,ab,kw OR ("hip NEAR/3 osteoarthritis"):ti,ab,kw OR ("hips NEAR/3 osteoarthritis"):ti,ab,kw OR (([mh hip] OR [mh "hip joint"]) AND ([mh ^osteoarthritis]))	2,374
3 - Combined	1 AND 2	893
4 - Filters	#3 AND [Cochrane Library publication date limit 2016-present]	609

Table continues on next page.

APPENDIX A (CONTINUED)

CINAHL Plus via EBSCO

#	Search Terms	Results
1 - Interventions	((MH "Combined Modality Therapy+") OR (MH "Electric Stimulation+") OR (MH "Transcutaneous Electric Nerve Stimulation+") OR (MH Traction+) OR (MH "Laser Therapy+") OR (MH Rehabilitation+) OR "Rehabilitation" OR (MH Phototherapy+) OR (MH Lasers+) OR (MH "Physical Therapy+") OR (MH Cryotherapy+) OR (MH Ice+) OR (MH Acupuncture+) OR (TI modalit* OR AB modalit*) OR (TI "electric stimulation" OR AB "electric stimulation") OR (TI "electrical stimulation" OR AB "electrical stimulation") OR (TI electrotherapy OR AB electrotherapy) OR (TI tens OR AB tens) OR (TI "transcutaneous electric nerve stimulation" OR AB "transcutaneous electric nerve stimulation") OR (TI electroacupuncture OR AB electroacupuncture) OR (TI acupuncture OR AB acupuncture) OR (TI needling OR AB needling) OR (TI heat OR AB heat) OR (TI cold OR AB cold) OR (TI traction OR AB traction) OR (TI laser OR AB laser) OR (TI lasers OR AB lasers) OR (TI rehabilitation OR AB rehabilitation) OR (TI "physical therapy" OR AB "physical therapy") OR (TI "physical therapies" OR AB "physical therapies") OR (TI physiotherap* OR AB physiotherap*) OR (TI cryotherapy OR AB cryotherapy) OR (TI hyperthermia OR AB hyperthermia) OR (TI "vapocoolant spray" OR AB "vapocoolant spray") OR (TI cryoanesthesia OR AB cryoanesthesia) OR (TI ice OR AB ice) OR (TI faradic OR AB faradic) OR (TI traction OR AB traction) OR (TI iontophoresis OR AB iontophoresis) OR (TI phonophoresis OR AB phonophoresis) OR (TI phototherapy OR AB phototherapy) OR (TI hydrotherapy OR AB hydrotherapy) OR (TI "light therapy" OR AB "light therapy") OR (TI diathermy OR AB diathermy) OR (TI ultraviolet OR AB ultraviolet) OR (TI infrared OR AB infrared)) OR ((MH "Therapeutic Exercise+") OR (MH Exercise+) OR (MH "Patient Education as Topic+") OR (MH crutches+) OR (MH Canes+) OR (MH Walkers+) OR (MH orthoses+) OR (TI exercis* OR AB exercis*) OR (TI massag* OR AB massag*) OR (TI "manual therapy" OR AB "manual therapy") OR (TI accupressure OR AB accupressure) OR (TI manipulat* OR AB manipulat*) OR (TI "applied kinesiology" OR AB "applied kinesiology") OR (TI stretching OR AB stretching) OR (TI stretch OR AB stretch) OR (TI stretches OR AB stretches) OR (TI "continuous passive movement" OR AB "continuous passive movement") OR (TI "continuous passive motion" OR AB "continuous passive motion") OR (TI plyometric OR AB plyometric) OR (TI plyometrics OR AB plyometrics) OR (TI "resistance training" OR AB "resistance training") OR (TI "strength training" OR AB "strength training") OR (TI strengthening OR AB strengthening) OR (TI weight-bearing OR AB weight-bearing) OR (TI weightbearing OR AB weightbearing) OR (TI weight-lifting OR AB weight-lifting) OR (TI weightlifting OR AB weightlifting) OR (TI "physical conditioning" OR AB "physical conditioning") OR (TI education OR AB education) OR (TI balneotherapy OR AB balneotherapy) OR (TI "aquatic therapy" OR AB "aquatic therapy") OR (TI "pool therapy" OR AB "pool therapy") OR (TI "water aerobics" OR AB "water aerobics") OR (TI "water running" OR AB "water running") OR (TI "water training" OR AB "water training") OR (TI "gait aids" OR AB "gait aids") OR (TI "gait aid" OR AB "gait aid") OR (TI "gait training" OR AB "gait training") OR (TI crutches OR AB crutches) OR (TI walker OR AB walker) OR (TI walkers OR AB walkers) OR (TI cane OR AB cane) OR (TI canes OR AB canes) OR (TI orthotic* OR AB orthotic*) OR (TI orthoses OR AB orthoses) OR (TI orthosis OR AB orthosis) OR (TI "activity modification" OR AB "activity modification") OR (TI "balance training" OR AB "balance training") OR (TI "functional training" OR AB "functional training") OR (TI "assistive devices" OR AB "assistive devices") OR (TI "assistive device" OR AB "assistive device") OR (TI mobilization OR AB mobilization) OR (TI mobilisation OR AB mobilisation) OR (TI "flexibility training" OR AB "flexibility training") OR (TI "endurance training" OR AB "endurance training") OR (TI "proprioceptive neuromuscular facilitation" OR AB "proprioceptive neuromuscular facilitation") OR (TI "manual resistance" OR AB "manual resistance") OR (TI "aerobic activity" OR AB "aerobic activity")) OR ((MH "Trigger Point+") OR (MH "Blood Flow Restriction Training+") OR (MH "Dry Needling+") OR (TI "trigger point*" OR AB "trigger point*") OR (TI "trigger area*" OR AB "trigger area*") OR (TI "blood flow restriction" OR AB "blood flow restriction") OR (TI "BFR therapy" OR AB "BFR therapy") OR (TI "dry needling" OR AB "dry needling"))	1,487,923
2 – Hip OA	((MH "osteoarthritis, hip+") OR "hip osteoarthr*" OR (hip N3 osteoarthritis) OR (hips N3 osteoarthritis)) OR (((MH hip+) OR (MH "hip joint+")) AND ((MH osteoarthritis)))	6735
3 - Combined	S1 AND S2	2363
4 - Filters	S3 AND [CINAHL publication date limit 2016-present; CINAHL Academic Journals limit]	1095

PEDro Physiotherapy Evidence Database

#	Search Terms	Results
1 - Interventions	Abstract & Title: (hip* AND osteoarthr*) and Published Since: (2016)	255
2 – Hip OA	Abstract & Title: (osteoarthr*) and Body Part: (thigh or hip) and Published Since: (2016)	244
3 - Combined	1 OR 2	469

APPENDIX B

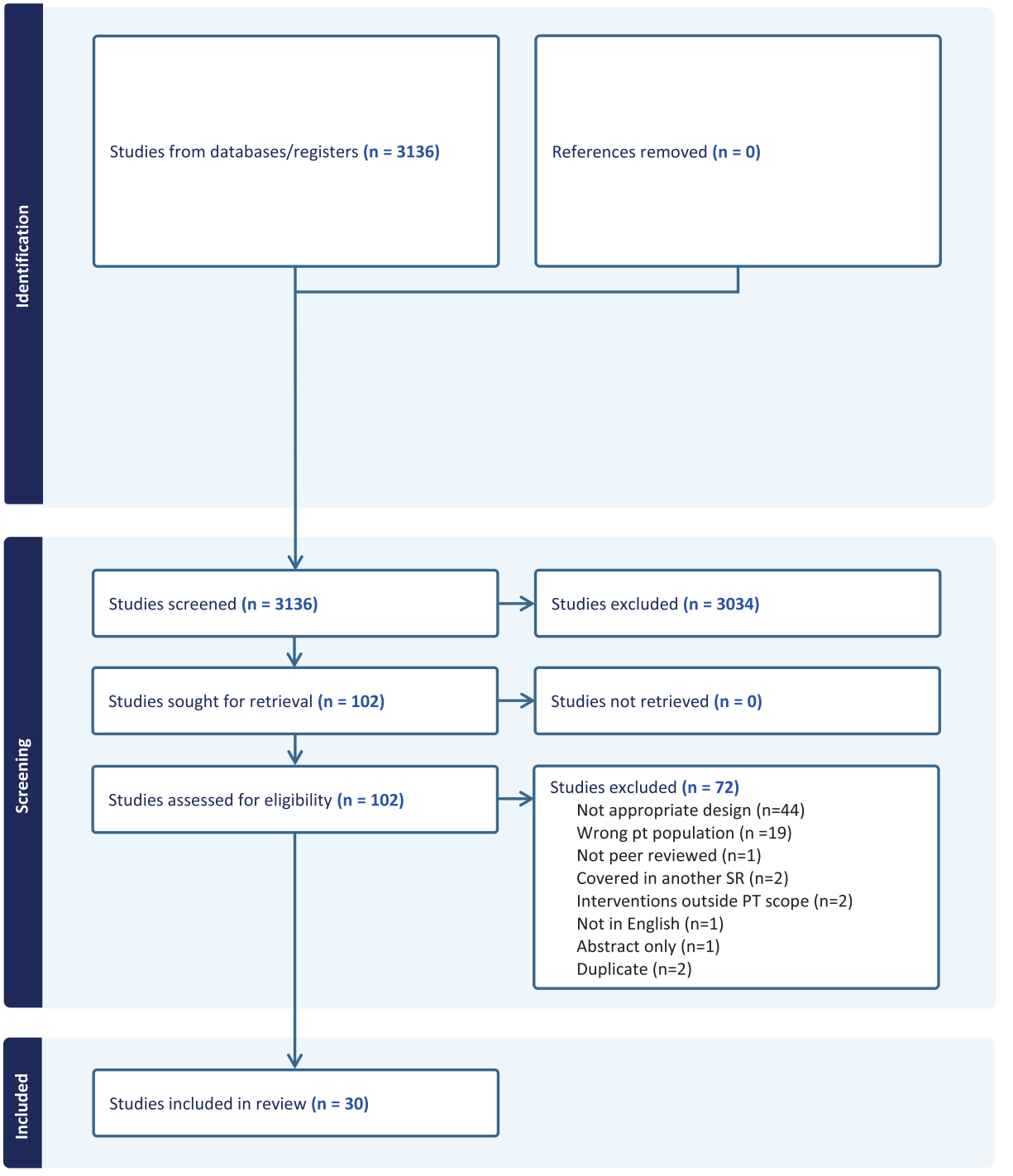
ARTICLE INCLUSION AND EXCLUSION CRITERIA

Inclusion	Exclusion
• Is the peer-reviewed article an appropriate design (systematic reviews, meta-analyses of RCTs, experimental RCTs) in a completed study and NOT a proposed study, clinical commentary/opinion paper or case study (<15 subjects)? • Are the subjects appropriate? A. At least 20 subjects with diagnoses of hip OA with either radiographic or clinical confirmation (using established criteria such as the ACR criteria) (at least 10 per group in an RCT) B. Population >18 years old C. Non-surgical population • Is the research design studying the effectiveness of interventions within the scope of the practice of physical therapy, including coordination training, functional training, gait training, balance training, modalities (including but not limited to heat, electrical stimulation, ultrasound, diathermy), manual therapy (including but not limited to manipulation, joint mobilization, soft tissue mobilization, massage), exercise (including but not limited to stretching/flexibility, proprioceptive neuromuscular facilitation, manual resistance, resistance/strength training, aerobic and endurance activities, community-based and self-management programs), assistive devices, and education, blood flow restriction, dry needling, trigger point • Interventions within the scope of the practice of physical therapy, including coordination training, functional training, gait training, balance training, modalities (including but not limited to heat, electrical stimulation, ultrasound, diathermy), manual therapy (including but not limited to manipulation, joint mobilization, soft tissue mobilization, massage), exercise (including but not limited to stretching/flexibility, proprioceptive neuromuscular facilitation, manual resistance, resistance/strength training, aerobic and endurance activities, community-based and self-management programs), assistive devices, and education, blood flow restriction, dry needling, trigger point	• Studies not published in English • Not Peer Reviewed (eg, an abstract, dissertation, etc) • Not appropriate design • Wrong patient population • Interventions outside the scope of physical therapist practice • Duplicate • Abstract only • Covered in another SR • Interventions outside the scope of physical therapist practice • Children (aged less than 18 years) • Nonarthritic intra-articular hip pain related primarily but not limited to the following: Avascular necrosis (AVN) Hip joint dysplasia FAI Acetabular labral tears Fractures Extra-articular pathologies including tendinopathy (primary diagnoses of gluteal, adductor, hamstrings, or hip flexor tendinopathy, tendon-related coxa sultans/snapping hip) • Interventions outside the scope of physical therapist practice • Exclude abstracts, press reports, editorial letters, and articles reporting on: Study protocols Animal studies Children (aged less than 18 years) Primary surgical studies

APPENDIX C

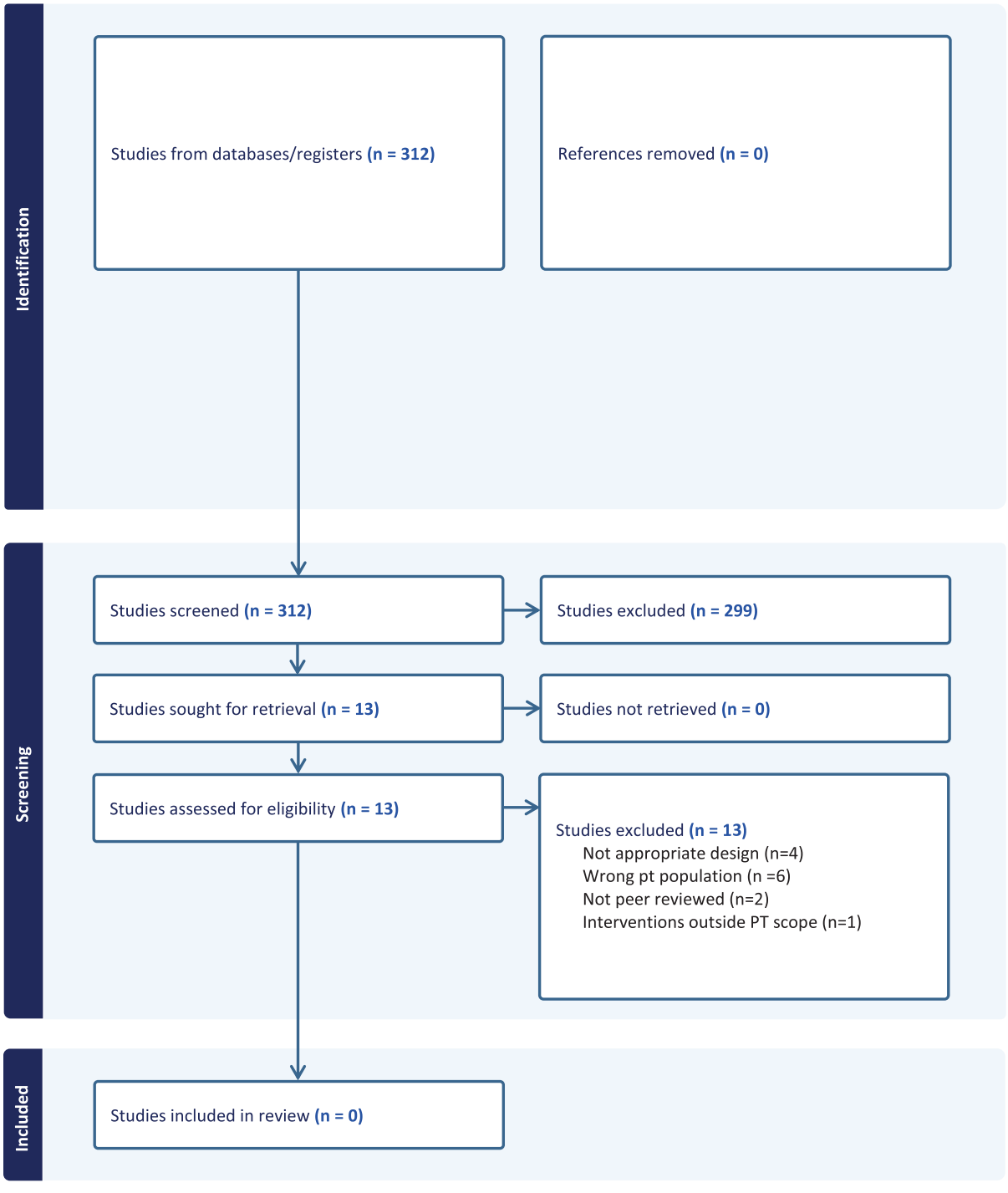
FLOWCHART OF ARTICLES

Hip Pain Mobility Deficits - January 2024



APPENDIX C (CONTINUED)

Hip Pain Mobility Deficits - October 2025



APPENDIX D

LEVELS OF EVIDENCE TABLE*

Level	Intervention/ Prevention	Pathoanatomic/Risk/ Clinical Course/ Prognosis/ Differential Diagnosis	Diagnosis/Diagnostic Accuracy	Prevalence of Condition/ Disorder	Exam/Outcomes
I	Systematic review of high-quality RCTs	Systematic review of prospective cohort studies	Systematic review of high-quality diagnostic studies	Systematic review, high-quality cross-sectional studies	Systematic review of prospective cohort studies
	High-quality RCT†	High-quality prospective cohort study‡	High-quality diagnostic study§ with validation	High-quality cross-sectional study ‖	High-quality prospective cohort study
II	Systematic review of high-quality cohort studies	Systematic review of retrospective cohort study	Systematic review of exploratory diagnostic studies or consecutive cohort studies	Systematic review of studies that allows relevant estimate	Systematic review of lower-quality prospective cohort studies
	High-quality cohort study‡	Lower-quality prospective cohort study	High-quality exploratory diagnostic studies	Lower-quality cross-sectional study	Lower-quality prospective cohort study
	Outcomes study or ecological study	High-quality retrospective cohort study	Consecutive retrospective cohort		
	Lower-quality RCT				
		Consecutive cohort			
		Outcomes study or ecological study			
III	Systematic reviews of case-control studies	Lower-quality retrospective cohort study	Lower-quality exploratory diagnostic studies	Local nonrandom study	High-quality cross-sectional study
	High-quality case-control study	High-quality cross-sectional study	Nonconsecutive retrospective cohort		
	Lower-quality cohort study	Case-control study			
IV	Case series	Case series	Case-control study		Lower-quality cross-sectional study
V	Expert opinion	Expert opinion	Expert opinion	Expert opinion	Expert opinion

Abbreviation: RCT, randomized clinical trial.

Adapted from the Center for Evidence-based Medicine 2009 levels of evidence.[216] See also* **APPENDIX E.

†High quality includes RCTs with greater than 80% follow-up, blinding, and appropriate randomization procedures.

‡High-quality cohort study includes greater than 80% follow-up.

§High-quality diagnostic study includes consistently applied reference standard and blinding.

‖High-quality prevalence study is a cross-sectional study that uses a local and current random sample or censuses

Weaker diagnostic criteria and reference standards, improper randomization, no blinding, and less than 80% follow-up may add bias and threats to validity.

APPENDIX E

PROCEDURES FOR ASSIGNING LEVELS OF EVIDENCE

- Level of evidence is assigned based on the study design using the Levels of Evidence table (APPENDIX D), assuming high quality (eg, for intervention, randomized clinical trial starts at level I)
- Study quality is assessed using the critical appraisal tool, and the study is assigned 1 of 4 overall quality ratings based on the critical appraisal results
- Level of evidence assignment is adjusted based on the overall quality rating:
  - High quality (high confidence in the estimate/results): study remains at assigned level of evidence (eg, if the randomized clinical trial is rated high quality, its final assignment is level I). High quality should include:
    - Randomized clinical trial with greater than 80% follow-up, blinding, and appropriate randomization procedures
    - Cohort study includes greater than 80% follow-up
    - Diagnostic study includes consistently applied reference standard and blinding
    - Prevalence study is a cross-sectional study that uses a local and current random sample or censuses
  - Acceptable quality (the study does not meet requirements for high quality and weaknesses limit the confidence in the accuracy of the estimate): downgrade 1 level
    - Based on critical appraisal results
  - Low quality: the study has significant limitations that substantially limit confidence in the estimate: downgrade 2 levels
    - Based on critical appraisal results
  - Unacceptable quality: serious limitations - exclude from consideration in the guideline
    - Based on critical appraisal results